WORLD PETROLEUM

MARCH, 1961

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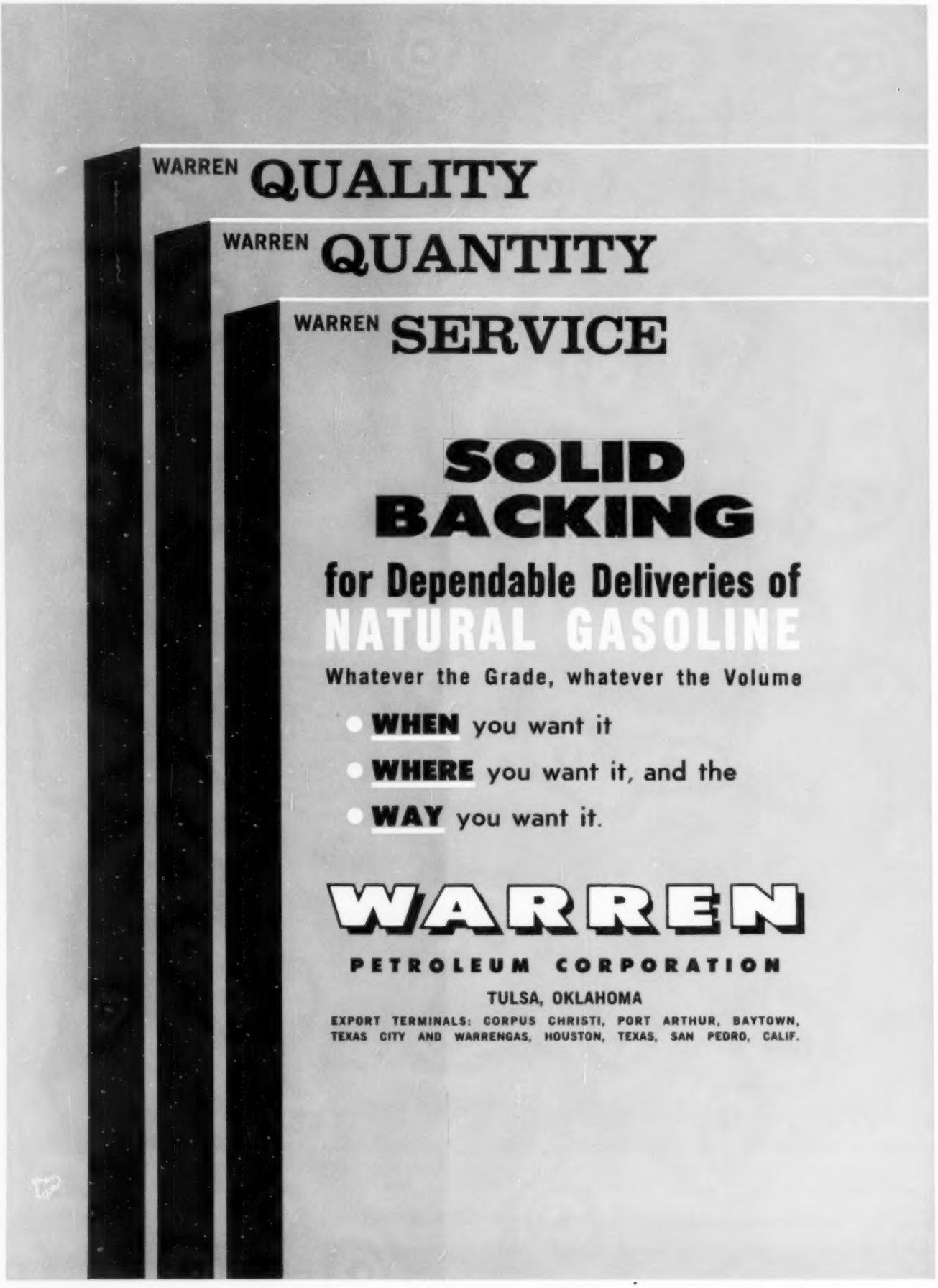
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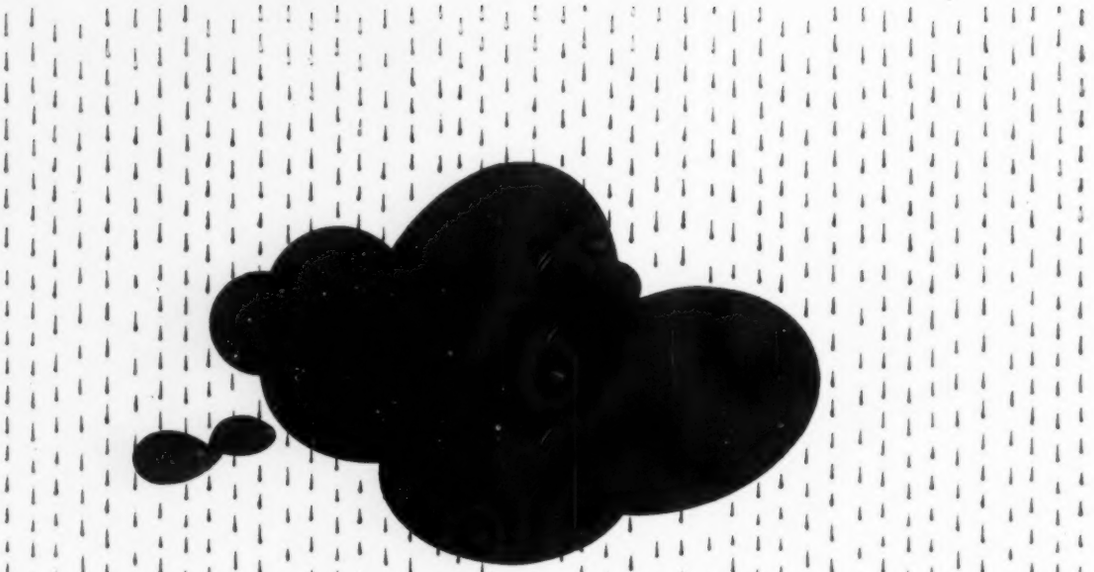

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VOL. 32, NO. 3, MARCH, 1961

World Petroleum

THE MANAGEMENT PUBLICATION OF THE INTERNATIONAL PETROLEUM INDUSTRY

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THIS MONTH'S COVER

shows a shooting boat moving away as a shot is fired off the Isle of Wight. British Petroleum is conducting a search off-shore from its home country, utilizing the services of Seismograph Services Ltd. Photograph is reproduced through courtesy of the company's own journal, BP Magazine.

Washington Pipeline

by Joseph B. Huttlinger

US Tax Changes Considered

Overseas expansion of US firms may be pulled up short by the outflow of gold. Some US Senators want to change the tax laws to make it less attractive to build plants abroad. They feel this could add to US tax revenues, cut down on the loss of gold abroad, and reduce the problem of imports in the years to come. And, they feel, it could take the place of other ways to handle the loss of gold: Expansion of exports, curbs on imports, curbs on foreign aid, and curbs on numbers of US persons abroad.

Sen. Albert Gore, D., Tenn., a thoughtful member of the Senate Finance Committee, is using the gold problem as an argument for changes in tax laws applying to foreign operations of US business. Mr. Gore is aiming at current tax laws which provide: (1) No taxes are due on earnings of US firms overseas until the earnings are brought back to the US. (2) A direct credit—not a deduction—from US taxes on taxes paid to the foreign government. Gore feels foreign earnings should be put on the same tax basis as domestic earnings. His changes are designed to do this.

The changes, he feels, would help cut down on $2.5 billion a year of gold outflow—by private business—and make it unnecessary to take other measures.

Overseas Depletion Attacked

Sen. Albert Gore, D., Tenn., took the Senate floor Jan. 9 to assail the grant of the depletion allowance for oil and gas operations abroad. He called it "utterly unjustifiable" to grant the depletion "on top of the foreign tax credit."

Loans to Small Oil

Leonard Latch of Lubbock, Texas, a producer of crude oil and natural gas, has received a loan of $350,000, the Small Business Administration announced. He had 15 employees at the time he applied for the loan, June, 1960, and planned to have 25 at the time he received it, the SBA said.

The SBA is furnishing 90% of the amount and private sources 10%. The SBA interest rate is 5.5% and the private sources are charging 6%.

The loan is for new equipment, working capital and debt payment. The term is five years. This is one of 103 loans to oil and gas producers, totaling $9,263,000, according to SBA records.

Dillon on Depletion

Douglas Dillon, the new Secretary of the Treasury, promised the Department's views later this spring on the income tax depletion allowance of 27.5% for crude oil and natural gas production.

He refused to tip his hand one way or the other on the matter this week in a day of searching questioning by members of the Senate Finance Committee on this and other tax matters.

It was Dillon's first chance to give his views on oil tax matters in public.

At one point, he seemed to defend the depletion provision for oil and gas operations of US firms outside the United States. Here, the provision faces the most attacks in Congress.

Sen. John Williams, R., Del., asked questions about the depletion allowance for domestic and foreign operations, starting by quoting the Democratic platform which assails "inequitable" depletion allowances.

Sen. Albert Gore, D., Tenn., raised questions about the depletion allowance for foreign operations, and other income tax incentives to US firms to go abroad.

"I am fully open-minded on this question and intend to study it very closely," Dillon told Williams. "The Treasury will have a position at the appropriate time later this spring one way or the other. But I wouldn't want to take a position on it now."

Dillon added that he understands President John F. Kennedy favors "a careful study" to see whether he wants a "revision downward or no change."

Under questions from Gore, Dillon said he understands the theory of giving depletion to foreign oil operations is that "the same law applies to the American company whether it operates within the US or abroad." He admitted depletion perhaps "is more valuable" abroad because of the high volume of wells.

He added the law was written to cover oil and other minerals "wherever they may be found, either here or abroad" and that Congress has not drawn a line between domestic and foreign operations.

Sen. Clinton Anderson, D., N.M., of the committee, said he was on the drafting committee for the Democratic platform and that the platform hits only at "inequitable" depletion provisions.

"Congress has declared many times that the oil depletion allowance is an equitable one," he added.

Gore chimed in, "I don't think Congress decided it was equitable; it decided to vote for it despite the fact it was inequitable."

Dillon asserted that the US must close tax loopholes if it is to cut tax rates for all. He favors a general revision of tax laws this year. He foresees a need for every dollar of revenue as a deficit is ahead. In this light, he might be tempted to look at depletion as a revenue raising measure.

Any effort to repeal or lower the depletion will run into trouble in Congress. House Speaker Sam Rayburn, D., Texas, asserted that Congress endorsed depletion years ago, and it is not going to change now.

Other tax authorities in Congress feel that US producers are due to lose either depletion or the present treatment of intangible drilling and development costs. Either is worth about the same to the producers.

Presidents Roosevelt and Truman asked Congress to lower the depletion allowance, but both were rebuffed by Congress. President Eisenhower and his Secretaries of the Treasury—George Humphrey and Robert B. Anderson—defended the allowance as "about right."

Gore opened the attack on depletion early this year. A few days after Congress convened, he called foreign depletion "wholly unjustified," on the Senate floor. He repeated his views during the questioning of Dillon.

Imports Forecasts

Oil imports to the United States may average 1,815,000 b/d in the first half of 1961, compared with 1,906,000 b/d in the first half of 1959; 1,888,000 b/d in the first half of 1960.

The 1961 figures are computed on the basis of allocations for crude and unfinished oils and finished products for the first six months, allocations of residual oil for the first three months, and estimates of imports of oil that will come in exempt from the program. The exempt imports include about 110,000 b/d from Canada, and about 250,000 b/d in Canadian bunker oils.

The allocations were made on much the same basis as in the past, despite a pre-election promise of Interior officials to change the rules to lower imports. An effort for change was tried, but ran into opposition inside the government and from oil importers.

So, only two changes were made. Interior officials who base allowed crude oil imports to Districts 1-4 on estimates of demand, agreed to give credit in the coming first half for past errors in estimates. As a result, crude oil imports of 689,896 b/d now allowed, are 19,260 b/d lower than they would be without the adjustment. This is because the US Bureau of Mines overestimated the demand a year ago.

While the adjustment works to lower oil imports now, it could as easily work to increase them in the future. During hearings on the proposals to change the rules, this was the only change that drew virtually no attack.

The second change cuts down imports into District 5, the West Coast, by the amount of increase in oil flow from the district to other areas of the United States. Thus, Interior officials cut down West Coast imports of crude by 11,500 b/d in an adjustment to take account of the step-up in District 5 shipments of oil to other areas of the United States since 1958.

Result of all this is that the program continues on very much the same basis as when it began in 1959. While there are obvious needs for changes, they were not made by the Eisenhower Administration. That regime dropped the problem into the lap of the Kennedy administration.

Independent Petroleum Association of America sees a need for "every effort" to support the program to curb imports. It wants "further improvements" in the program. Chiefly, IPAA wants crude imports to Districts 1-4 related to crude oil rather than total oil demand. Oil importers have other ideas, such as denying any quota to inland refiners. And small refiners want a special role for themselves.

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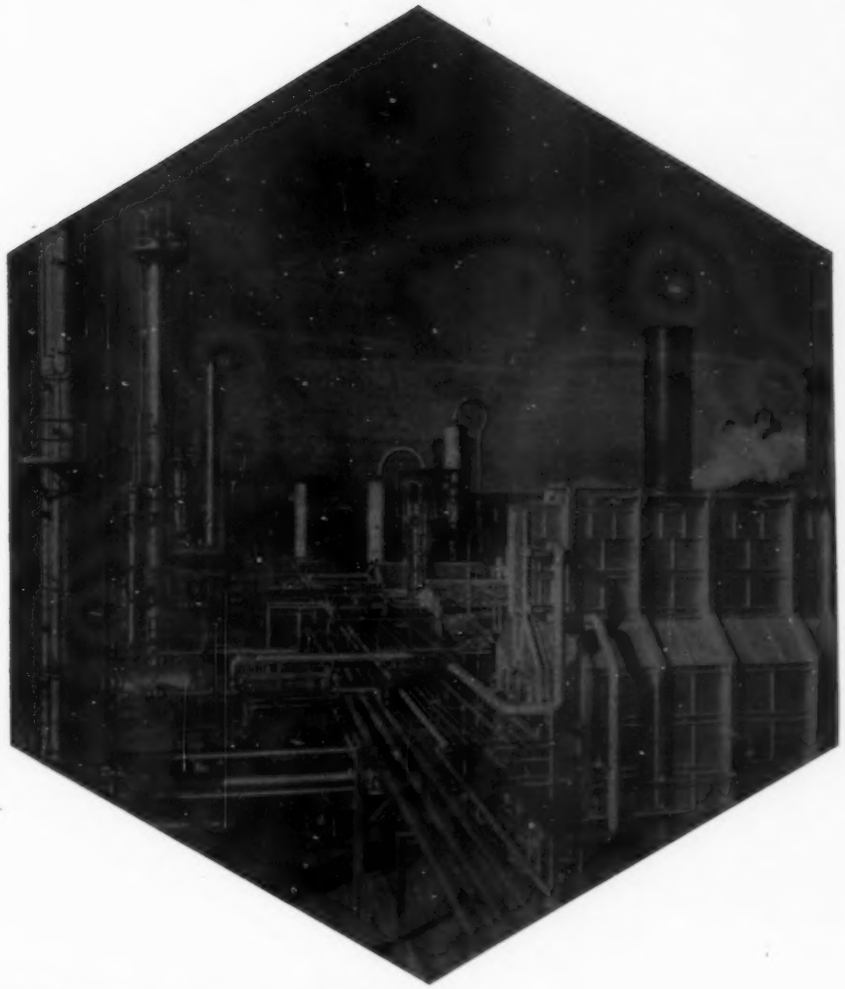

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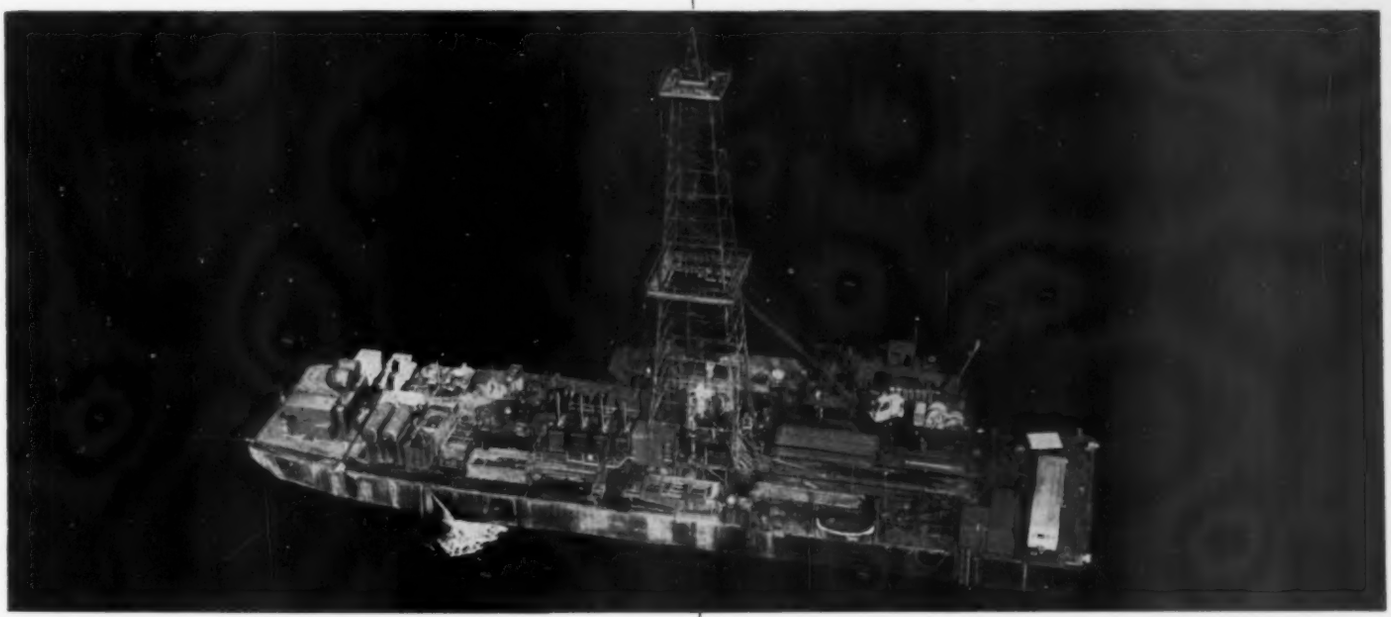
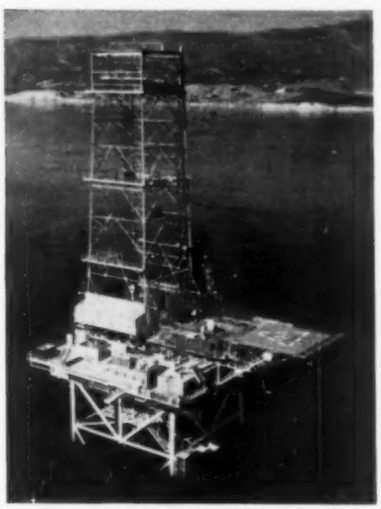


WODECO FLOATING BARGE OFF THE CALIFORNIA COAST. BARGE—254 ft. x 68 ft. x 18 ft. steel. DERRICK—108 ft. steel designed to rack 10,000 ft. 3½ drill pipe in 60 ft. stands. DRILLING EQUIPMENT—one 12,000 ft. Diesel rig with a total of 2100 horsepower.



FIXED PLATFORM OFF THE CALIFORNIA COAST erected by Standard Oil Company of California and Humble Oil and Refining Co. PLATFORM—178 ft. platform permanently set in 100 ft. of water, 2.2 miles off the coast in open ocean (plus 147 ft. derrick). PROVISION for completion of 25 wells. DRILLING EQUIPMENT—two completely independent 12,000 ft. rigs powered by electric current from the shore.

OFFSHORE OPERATION

WESTERN OFFSHORE DRILLING AND EXPLORATION CO., marine drilling subsidiary, is in a position to supply equipment and trained personnel for marine operations anywhere. In addition to the floating marine equipment pictured above, Wodeco, during the past four years has operated the motor vessel "M. V. Torry" offshore in California and South American waters drilling slim holes for geological information to depths in excess of 6,000 ft.; two 12,000 ft. electric rigs are operating from offshore platforms.

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The Haney and Williams organization has operated outside the continental United States since 1950 in Mexico, Uruguay, Brazil, Alaska and Ecuador. Equipment, trained crews and experienced supervisory personnel are available for drilling operations anywhere.

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"Autovista"

This is the name given by British Petroleum Co. to a revolutionary new system, employing electronics for the first time, that its distribution engineering branch has designed and developed in conjunction with De Havilland Engineering Co. for motor fuel retailing, and for which patent applications are pending covering the basic principles. The system is being installed at service stations in the UK and Italy in the near future.

A conventional system requires a separate dispensing unit for each type and grade of fuel and the motorist has to place his car exactly on the pump island for delivery, frequently causing queuing and delay.

The "Autovista" system enables any grade of fuel —from motorcycle mixture to diesel oil—to be delivered from a portable giraffe-shaped hose unit or units placed anywhere on the forecourt. These 3-hose units have a maximum delivery of 15 gpm—the most rapid fuelling achieved to date, and this can be by pre-set gallonage or money value.

Automatic blend control facility is also incorporated at the nozzle of two of the three hoses in each delivery unit. Pre-setting is done on the read-out selector unit, a small portable console, and thus the motorist can easily see the grade and quantity of fuel delivered without leaving his car. It is claimed that the time spent on the forecourt can be cut in half by this new system.

The electronic computer incorporated also aids in speeding up the business side of oil retailing. It not only serves the forecourt with a printed ticket, but also transmits the relevant information for accounting to a central source or for transmission to supply depots for programming deliveries.

Manufacture of "Autovista" units is in the hands of De Havilland at its Leavesden works, Hertfordshire, where a unit was demonstrated recently before shipment to Germany for weights and measures approval.

This new system is believed the greatest basic change in motor fuel station design in very many years. Sweeping away the conventional pump island, or islands, gives the designer scope he has never known before, both practically and aesthetically. Even the submerging of the fuel pumping equipment into the storage tanks is a factor in aid of greater flexibility for forecourt layout.

New Year Honors List

Sir Alexander Fleck, former chairman of Imperial Chemical Industries, has been created a baron in the New Year Honors List in recognition of his public services. Sir Alexander is chairman of the advisory committee on research and development of the Ministry of Power and of the Nuclear Safety Advisory Committee.

V. Evans, manager (administration) of BP Refinery (Llandarcy) Ltd., has been made a Member of the Most Excellent Order of the British Empire (MBE).

J. M. Cooper

Vincent Evans

Honorary CBE for US Oil Man

A fitting climax to the services of John M. Cooper with Kuwait Oil Co. was the announcement shortly before his retirement at the end of 1960, and his return to the States, that the Queen had conferred on him the high rank of an honorary Commander of the Most Excellent Order of the British Empire (CBE) in recognition of his valuable services in furthering Anglo-American partnership in the oil industry.

Mr. Cooper had been with Gulf since 1923 when he was appointed assistant managing director in London of KOC, becoming a director in 1960. He has now accepted a post with Gulf as consultant in Kuwait and Middle East affairs.

E. C. Masterson

L. T. Jordan

Leland T. Jordan has been appointed to succeed Mr. Cooper as assistant managing director. He is at present the company's general manager in Kuwait and will continue to be resident there.

E. C. Masterson has been appointed general manager, London. He has been with KOC since 1948, which he joined after a long and distinguished career in the oil industry both in the US and in Europe, particularly in Romania.

Monsanto Polyethylene Expansion

Monsanto Chemicals Ltd. will expand the polyethylene production capacity of its Fawley (Southampton) plant by a further 50% above the current figure of over 17,000 ton/yr. The first stage is scheduled to be fully operational early 1963 and plant layout will facilitate the addition of further units. This is the second expansion project since the plant was opened early 1959 with 10,000 ton/yr capacity.

Dussek Brothers' New Interest

Dussek Brothers & Co. Ltd., oil and bitumen refiners, has secured a controlling interest in Claud Campbell & Co. Ltd., wax specialists. The business of Waxes Ltd., a Dussek subsidiary, has been merged with Claud Campbell and the amalgamated business is now being carried on as Claud Campbell Waxes Ltd.

Gas Turbine Locomotive

British Railways is carrying out trials with a 2,700-hp gas turbine locomotive designed and built by The English Electric Co. This is expected to give valuable operating experience with a comparatively new form of motive power and the engine will enter revenue service later this year.

Power is drawn from an English Electric EM 27 L gas turbine specially developed for direct mechanical drive, with a separate power turbine and employing a simple reverse and reduction gear box. With a full tender—containing 2,000 gal of gas oil and 1,750 gal of water as well as train-heating equipment (a total load of over 15 tons)—the complete locomotive weighs 123 tons.

Oil Equipment in Mexico

The Council of British Manufacturers of Petroleum Equipment has made a provisional arrangement with British Overseas Fairs Ltd. for an "excellent portion" of an exhibition in Mexico City to be set aside for its members in order that a mass display of petroleum and petrochemical equipment can be made. Some 4,600 sq ft of outside sites will be available and 1,300 sq ft inside.

This exhibition—"British Equipment for Mexican Industry"—will be from September 29 to October 15 next and it is being arranged jointly by the Dollar Exports Council and the Federation of British Industries.

Distillers' Year-End Review

New developments announced in 1960 by The Distillers group will involve a total capital expenditure of some £29 million and its year-end review considers that 1961 should provide further scope for the group to consolidate its position over a wide field.

Particular mention is made of the striking progress made by the British Hydrocarbon Chemicals, the further extensions completed at its Grangemouth plant, and the proposal to erect a new petroleum chemicals base at Baglan Bay near Port Talbot in South Wales, broadly on lines similar to those developed at Grangemouth.

More 77,000-Ton Tankers for Esso

Esso Petroleum Co. has ordered two more 77,000-ton tankers, making five of this size now on order, part of the overall building program of 12 such vessels. The latest orders have been placed with Verolme United Shipyards, Holland, and Kockums Mekaniska Akt, Sweden.

Whessoe Secures Indian Contract

Whessoe Ltd., Darlington, has secured from Oil India Private Ltd. a £900,000 contract for supply and erection in Upper Assam of plant to "condition" crude oil before it is delivered to the 720-mile pipeline from the Nahorkatiya oilfield to the new refineries at Nunmati and Barauni. There was intense competition for this contract, which was put out to international tender.

Information and its Dissemination

This is the subject chosen for this year's summer meeting of the Institute of Petroleum, to be held at Harrogate from June 7 to 10. Under this general theme it is proposed to present the following six papers for discussion: (1) role of an information department; (2) the information department—how it should work; (3) presentation of information; (4) technical information retrieval; (5) internal communications and employee information; and (6) informing the public.

(Continued on page 12)

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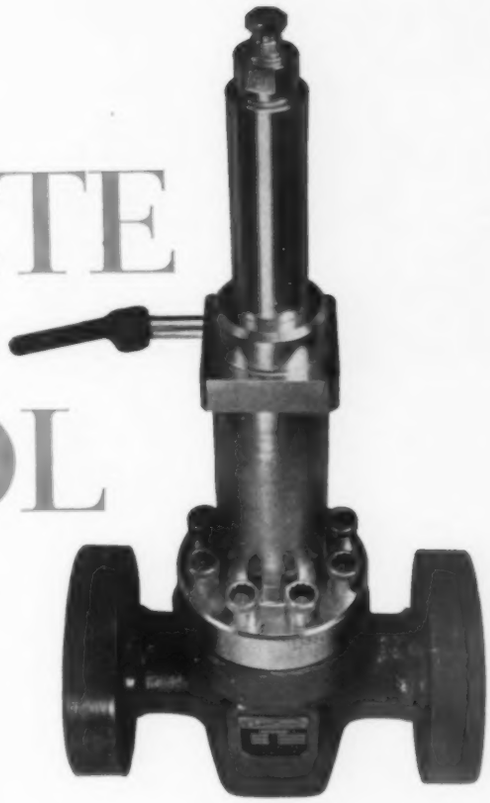

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London Letter

(*Continued from page 10*)

Esso's UK Oil Search

Esso Petroleum has applied to the Ministry of Power for licenses to prospect for oil and gas over extensive areas of Hampshire, Kent, Surrey and Sussex. A total of about one million acres has been selected for examination and, if approval is given, geophysical work will be started without delay. The areas chosen lie largely in the coastal regions and it is felt they deserve closer examination as they appear to contain similar geological structures to those in the Paris basin in northern France where oil has been found in commercial quantity.

Except for a small quantity from an Esso well at Dalkeith in Scotland, all UK crude oil output—nearly 85,000 tons last year—was produced by British Petroleum and almost entirely from its fields in Nottinghamshire and Leicestershire.

Appointments

J. R. PAYNE, manager of Esso Petroleum Co.'s Midland division since 1950, has been made a director of Esso Petroleum Co. (Ireland) Ltd. and of Cleveland Petroleum Co. (Ireland) Ltd. and of Cleveland Petroleum Co. Ltd. and is now at the London head office.

J. R. Payne

G. G. USMAR, formerly sales manager of the Scottish division, has succeeded Mr. Payne as Midlands manager.

N. P. BIGGS, who has been a director of Cleveland Petroleum Co. since 1956, has been appointed chairman following the retirement of **R. J. PINDER**. Mr. Pinder has also retired as a managing director of Esso Petroleum after being 40 years with the company.

Britain's Largest Companies

"Company Assets and Income in 1957," a Board of Trade analysis published recently, shows three companies associated with petroleum — Imperial Chemical Industries, Distillers and Esso—to rank in the first dozen in order of net assets in the very large number listed. The analysis covers all companies with net assets of £1 million or more and whose shares are quoted on a UK stock exchange.

Only 12 companies are listed with net assets of £100 or more. The fact that the survey is limited to those engaged mainly in the UK in manufacture and distribution excludes those like the "Shell" group and British Petroleum, though many smaller oil companies figure in the tables.

New Publications

"ICI Titanium" 3: Corrosion Resistance—The last of the series of five brochures on the properties of Imperial Chemical Industries' titanium, this one discusses in condensed form its exceptional resistance properties to corrosive media, and where and where not to use it. The greater part is devoted to a 9-page table of its resistance to (a) simple chemical reagents, (b) industrial liquors, and (c) liquid metals, with data on concentration, temperature, and a rating.

This and the others in the series—1. Wrought products, 2. Physical and mechanical properties, 4. Fabrication, and 5. Weight tables—are available from ICI Metals Division Headquarters, P. O. Box 216, Birmingham 6, England.

"A History of Flow Measurement by Pressure-Difference Devices" Such has been the continued demand from George Kent Ltd. for reprints of its series of articles published under this general title between 1952 and 1959 that they are now made available in a single volume, with 11 appendices and replies to discussion and correspondence. Section titles are: I. The work of Venturi; II. The part played by Clemens Herschel; III. Development of the Venturi meter and some notable installations; IV. Development of Venturi recorders from 1894 to 1911; V. Commercial metering of air, gas and steam; VI. Further diaphragm-operated instruments, including steam meters; and VII. Developments in differential producers for flow measurement. Copies are available from George Kent Ltd., Luton, Beds., price 10s.

British Equipment News

Decca Navigator Co.'s equipment has now been installed on about 60 BP Tanker Co.'s vessels, and over 150 will have been equipped by next June. A Decca Navigator chain has now been set up covering the Persian Gulf and this will shortly be in full operation.

Head Wrightson & Co. Ltd. has formed Head Wrightson India Ltd., with headqaurters in Calcutta, to handle its expanding interests in that country. This new wholly-owned subsidiary will act as a contracting company for the supply, from Indian sources as far as possible, or varying types of plant to the parent company's designs. Later it is hoped to incorporate a rupee company.

The heat exchanger division of *The Lummus Co. Ltd.* has been awarded a £100,000 contract for the design and erection of the heat exchangers for installation in the ethylene unit being installed at Shell Chemical Co.'s Carrington plant.

Ruston & Hornsby Ltd., Lincoln, and its associate company, *Davey, Paxman & Co. Ltd.*, Colchester, have received orders valued at over £100,000 through Foster Wheeler Ltd. for diesel engines and other equipment for the new Turkish 65,000 b/d refinery at Mersin being built by BP, Shell and Socony Mobil. The Ruston order includes two 7-cylinder diesels of 985 bhp at 520 rpm and three of 710 bhp at 600 rpm for driving oil transfer pumps between 1,450 and 1,775 rpm. A shunting loco will be supplied powered by a 275 bhp Paxman diesel and 6½ million Btu/hr Paxman packaged boiler for hot water services.

W. H. Allen Sons & Co. Ltd. has received an order for 36/34-in. horizontal-spindle, double-suction cooling water pump for Esso Petroleum's Fawley refinery. This will pass 33,000 US gpm against a total head of 212 ft.

US Equipment Links

Weir Valves Ltd., Glasgow, has issued shares to Pacific Valves, Inc., Long Beach, Calif., under the agreement whereby Weir Valves will manufacture and market Pacific's products throughout the world except the USA. The company's name has also been changed to Weir-Pacific Valves Ltd. but will continue to be controlled by G. & J. Weir Holdings Ltd.

Stothert & Pitt Ltd., of Bath, Somerset, has entered into an agreement with Ellicott Machine Corp., of Baltimore, for the manufacture under license in the UK of all sizes of dredges and dredging machinery of Ellicott designs and specifications.

Simms Motor Units Ltd., London, and the Bendix Corp., Detroit, have entered into an agreement whereby Simms grant to Bendix an exclusive manufacturing license and selling rights throughout the USA of its full range of diesel fuel injection equipment. Bendix also acquires non-exclusive selling rights of this equipment in Canada, Mexico and Brazil, and assumes complete responsibility for servicing throughout this area. Simms' interests will be handled by the Scintilla Fuel Injection Division of Bendix at Sidney, N. Y. and a large expansion of its site is planned for this purpose.

UK Crude Imports Up 14.4%

Crude oil imports into the UK in 1960 rose by 41,840,000 bbl (14.4%) over 1959 to a new high level of 332,202,000 bbl, and total imports rose by 47,579,000 (12.3%) to a record 432,874,000 bbl (1,183,000 b/d).

Despite the rise in refined oil imports, the proportion of crude rose to 76.7% from 75.4%, and Kuwait was more than ever the predominant supplier. The total from this country of 162,792,000 bbl, against 120,889,000 bbl in 1959, means that Kuwait supplied 49.0% of crude oil imports against 41.6% in 1959, or 37.6% of total imports against 31.4%. Were not so large a proportion of crude undisclosed in 1960, it can be assumed safely that Nigerian crude would figure to a much larger extent than the 2,009,000 bbl (cif value, £2.9 million) imported in 1959. As expected, fuel oil again leapt upwards, showing a rise of 34.6%.

Unit cif value of crude fell 0.50 d/imp gal (6.8%) below the 1959 level to 6.89 d, and fuel oil 0.38 d/gal (5.4%) to 6.67 d.

Some details of imports and exports are shown in the accompanying table.

UK OIL IMPORTS AND EXPORTS

	Volume in 1,000 bbl		Value in £ million	
IMPORTS	**1960**	**1959**	**1960**	**1959**
Crude and partly refined oil				
Eastern Hemisphere:				
Middle East	268,231	228,799	260.9	240.2
Europe	2,471	849	4.9	1.7
Far East and Australasia	880	4,424	1.3	6.3
Africa		2,911		3.1
Total	271,582	236,983	267.1	251.3
Western Hemisphere:				
Latin America	52,726	52,976	58.0	61.0
North America	431	403	0.8	0.7
Total	53,157	53,379	58.8	61.7
Unallocated	7,463*		8.0	
Total crude	332,202	290,362	333.9	313.0
Refined oil				
Motor spirit	21,914	24,952	40.7	47.0
Other than motor spirit	2,429	972	4.0	2.2
Kerosine	5,859	10,354	9.9	18.1
Lubricating oil	3,930	2,927	13.0	9.7
Gas oil	16,620	15,834	25.1	25.9
Diesel oil	563	1,731	0.8	2.7
Fuel oil	49,357	36,673	48.0	37.7
Other heavy oils	**	1,490		2.5
Total refined	100,672	94,933	141.5	145.8
Crude and refined	432,874	385,295	475.4	458.8
EXPORTS				
Total liquid products	65,322	57,900	96.1	88.5
Re-exports	1,389	3,743	1.8	5.5
Bunkers (foreign trade)	28,119	27,485		

*Other Commonwealth and Irish Republic 6,716,000 bbl (£7.2 million). Other foreign, 747,000 bbl (£0.8 million).
**Included in lubricating oil.

Airlift Australia

AUSTRALIA'S Snowy Mountains Scheme has presented some unusual challenges to BP as sole supplier of petroleum products. Some of these challenges have been met in unusual ways, such as fuel drops from aircraft.

This gigantic project, midway between Sydney and Melbourne, with its great dams, power stations, and miles of tunnels and aqueducts, is designed both to provide hydro-electricity and to divert irrigation water westwards into the parched plains.

British Petroleum is proud to be associated with the Snowy Mountains Scheme, one of the world's greatest engineering undertakings.

BRITISH PETROLEUM

BP

CANADIAN NOTES

Oil Production Up

January crude oil production is forecast for new alltime high of 615,686 b/d. This is 2½% above previous high of 601,666 b/d in January 1960. February forecast is 612,750 b/d, up from 558,093 b/d last February. March is due for decline to 573,082 b/d, but is up slightly from 570,107 b/d last year.

Canadian Petroleum Assn. estimates crude-oil production in Canada during 1960 rose to average 522,000 b/d from 506,000 b/d in 1959; while exports to the USA went up to 112,000 b/d from 92,000 b/d in 1959. Although exports had a healthy increase of 20,000 b/d, or 22%, crude production rose only 16,000 b/d. Canadian crude consumed by domestic refineries in 1960 declined 4,000 bbl, about 1%, reflecting lower refinery crude throughput in Alberta, Saskatchewan, and Ontario.

The boom in crude-oil imports into Canada is over. Refiners indicate a greatly reduced volume through February 1961. Three months December-February will average only 333,000 b/d compared with the high of 442,441 b/d in November. They will be up only 5% over average in same year-earlier period.

New all-time highs for use of Canadian crude in domestic refineries are estimated for January-February—467,669 b/d in January; 470,590 in February. These figures exceed January 1960 by 2½% and February by 10%.

Refinery Expanded

Consumers' Co-operative Refineries Ltd. has completed $2 million expansion program at Regina refinery. Installations included new 3,000 b/d Platformer, 6,000 b/d middle distillate Unifiner, three new gas-fired furnaces and auxiliary buildings and equipment.

Royalite Earnings Rise

Net income of Royalite Oil Co. Ltd. for 1960 is estimated at approximately $1,050,000 compared with $637,681 for the previous year. Sales volumes of gasoline, heating oils and diesel fuels through company outlets increased approximately 13% in 1960. During the year, 81 additional marketing outlets were acquired, bringing total retail and bulk stations to 723 at the year end.

During 1960, Royalite participated in the drilling of 24 wells. Eight were successfully completed as oil wells and four as gas wells.

Camrose Supplies Line Pipe

Camrose Tubes, Ltd., an affiliate of Page-Hersey Tubes, Ltd., has completed an initial order for 20 miles of 36-inch pipe for Alberta Gas Trunk Line, Ltd., was working on an order for 127 miles of 30-inch pipe, and has other contracts in the works. The Camrose mill is located about 75 miles north and east of Red Deer. It is to complete an addition to cost $4,000,000 about the middle of 1961.

Saskatchewan Medium-Gravity Crude

Saskatchewan medium-gravity crude is expected to be in preferred market position during 1961. Texaco-Canada took 7,500 b/d in December for its refinery at Port Credit, Ontario, following success with trial batch. This trend may give Saskatchewan good increase, mostly at expense of Alberta light crude.

Imperial's Net Up

Earnings for Imperial Oil Ltd. for 1960 have been estimated at $61 million, equal to $1.94 per share. This is 12% more than the company's 1959 earnings of $54,525,000, or $1.73 per share.

Canadian Pipeline Runs

Trans Mountain Oil Pipe Line Co. reports total crude deliveries during December 1960 averaged 95,708 b/d. Average deliveries for all of 1960 were 113,143 b/d compared with 98,239 b/d in 1959. Deliveries through the line in January 1961 were expected to average 128,000 b/d.

Canadian Well Completions

November 1960 hit an abrupt slump after a booming October. Total of 164 wells drilled was down 59 wells, or 27% from 223 completions in November 1959. It was poorest month of 1960 in relation to previous year. No substantial pickup was evident for December, as northern areas did not accelerate as much as usual for winter season.

Manitoba Discoveries

Two indicated oil discoveries by Texaco Exploration in Hartney district of southwestern Manitoba are standing with production casing set, but Texaco has declined to reveal any information. It is understood both wells have trouble—some water intrusion, a common problem near Mississippian truncation edge. Doubtful about prospects for commercial completion, Texaco is reticent about statement.

Package Gas Plant in Alberta

New prefabricated package gas-processing plant has been installed by British American in Gilby field of west-central Alberta. Total erection time was only one month for the unit whose daily capacity is 15 million cubic feet. B-A considers this type of plant ideal solution for minor fields where operators want to avoid heavy cost of normal type processing plant.

Geophysical Down

Usual winter peak of geophysical exploration in Canada has been disappointing. January had only 89 crews at work, down nine crews or 9% from January 1960. Downturn was especially disappointing as November had shown increase over November 1959. Unusually mild weather and poor market outlook are blamed.

New Terminal at Vancouver

British American Oil's new $1.5 million Burnaby marine terminal is nearing completion on the south shore of Burrard Inlet, approximately one mile north of the company's Port Moody refinery.

The new distribution center has been built on a five-acre site and will replace the original B-A west coast marine terminal at Port Moody, where facilities have become outdated.

Main building of the new terminal is a modern 100 ft by 200 ft warehouse which includes a lube oil blending plant. The terminal features two L-shaped docks, a new 160-ft dock to serve smaller vessels supplying B.C. coastal points, and the existing 400-ft. pipeline-type dock which will be remodeled and will continue to load deep-sea ships with products for exports.

Vancouver contractors handled all work on the terminal project. Earthwork was by Campbell-Bennett Ltd., dockwork by Fraser River Pile Driving Co. Ltd., bridge and trestle by Greenlees Pile Driving Ltd., warehouse and facilities by C. J. Oliver Ltd., and piping by the Bay Co., B.C. Ltd. Consultants for the project were Wright Engineers Ltd. and C. B. Archibald & Associates Ltd.

Non-Resident Taxes Rise

For USA companies with foreign investments limited to Canada or the United Kingdom through a Canadian subsidiary, new Canadian taxes will take about 65% of gross income in Canada instead of an amount which until just recently about equaled the 52% USA corporate income-tax rate. The Canadian income-tax rate is 50%, and a new dividend tax adds about 15% for a total effective rate of about 65%. Corporations will not be able to avoid the special dividend levy by switching to branch operations in Canada, because the budget resolutions imposed a corresponding 15% increase in taxes on profits taken from Canadian branches by their foreign parents.

Alberta Allowable Up

Permissible rate of Alberta crude and condensate production has been set at 438,778 b/d during January 1961 by the province's conservation board. This is an increase of 26.2% from 347,563 b/d in December, but is 0.3% below the 439,758 b/d for January 1960, the highest previous level over the past year. The latest allowable rate is 4% more than the average of 421,682 b/d asked for by purchasers of Alberta oil for January 1961.

Breaks Ground for New Plant

L. D. Campbell, chairman of The Halliburton Co., congratulates H. C. Otis, Sr., chairman of Otis Engineering Corp., following ground breaking ceremonies for the new Otis general offices and plant to be constructed on the edge of Dallas in Carrollton, Texas. Pictured left to right are: Mr. Campbell, Mr. Robert McInnish, mayor of Carrollton, Robert H. McLemore, president of Otis Engineering Corp., and Mr. Otis. The new Otis plant and general offices will occupy a 68-acre tract.

Compressors to Trans Canada

As part of a multi-million dollar expansion program to export natural gas to the USA, Trans-Canada Pipe Lines Ltd. has taken delivery of three Clark Gas Turbine-Centrifugal Compressor Sets which will pump approximately 700 mmcfd of gas through the world's longest natural gas pipeline. Sold by Clark Compressor Co., Ltd. (a Dresser subsidiary in Canada), the Turbine-Compressor Sets, costing several million dollars, were manufactured at Olean, New York, by Clark Bros. Co., a division of Dresser Industries, Inc., Dallas, Texas.

The compressors will be located in new stations being added to the western portion of the Trans-Canada line running through southern Saskatchewan. The stations—located near Cabri, Herbert and Regina—are spaced between existing compressor stations powered by nine Clark Model TLA-10, 3400 bhp reciprocating, gas-engine-driven compressors.

Personals

E. S. DAVIS and **R. F. B. TAYLOR** have been named vice presidents of the Trans Mountain Oil Pipe Line Co. and its subsidiaries. Mr. Davis joined Trans Mountain in 1953 as general superintendent and was appointed operations manager in 1954. Previously he spent 21 years in the manufacturing division of Imperial Oil Ltd. Mr. Taylor joined Trans Mountain as treasurer in 1952. Formerly he was financial advisor for Trans Mountain on the staff of Canadian Bechtel Ltd.

DONALD I. LAWLESS, vice president of Canadian Bishop Oil, Ltd. has been elected president of Bishop Oil Co., to succeed Louis J. Brunel, retired. Mr. Brunel will continue as a director and serve the company in a counseling and advisory capacity. He reached retirement status on January 1.

Nine-Day Allowable Continued

Crude-oil production in Texas during January 1961 was put on a nine-day basis, maintaining the schedule in effect during December. Chairman Thompson of the Texas R.R. Commission earlier had suggested an increase in production because purchasers reported their inventories were below "desired levels." At the proration hearing, however, only one company specifically requested an increase.

Tax Break for Subsidiaries

A tax regulation attached to a new law passed last summer, designed to give USA companies a more equitable tax break on their foreign subsidiaries, permits domestic companies doing business overseas to lump together the taxes their foreign subsidiaries pay to foreign governments as a domestic tax deduction, rather than base their USA taxes on a country-by-country reporting of their foreign-subsidiary tax payments. This means that where a domestic company's foreign subsidiary is paying more than the USA corporate rate of 52%, that payment will help raise the overall average of foreign tax payments and give the USA company a bigger USA tax deduction.

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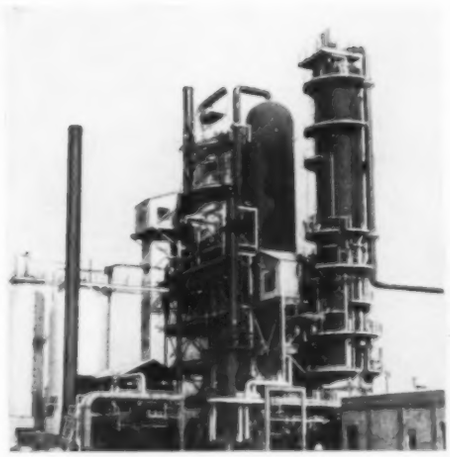
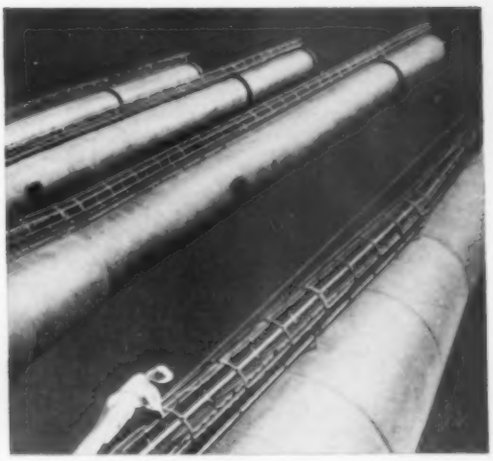


Montreal refinery. Regenerator towers gunited

Kwinana refinery. Towers gunited



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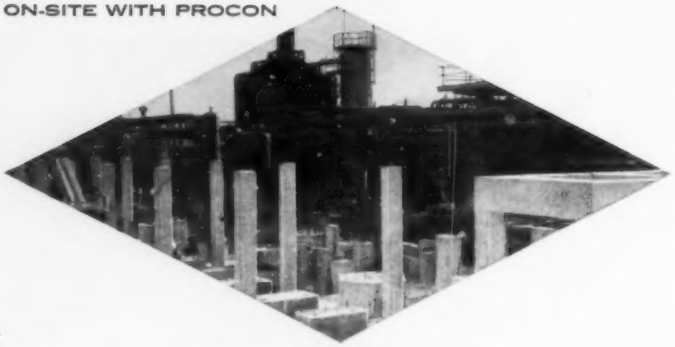

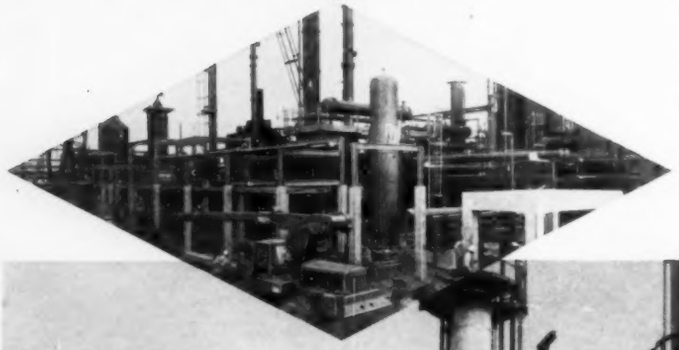

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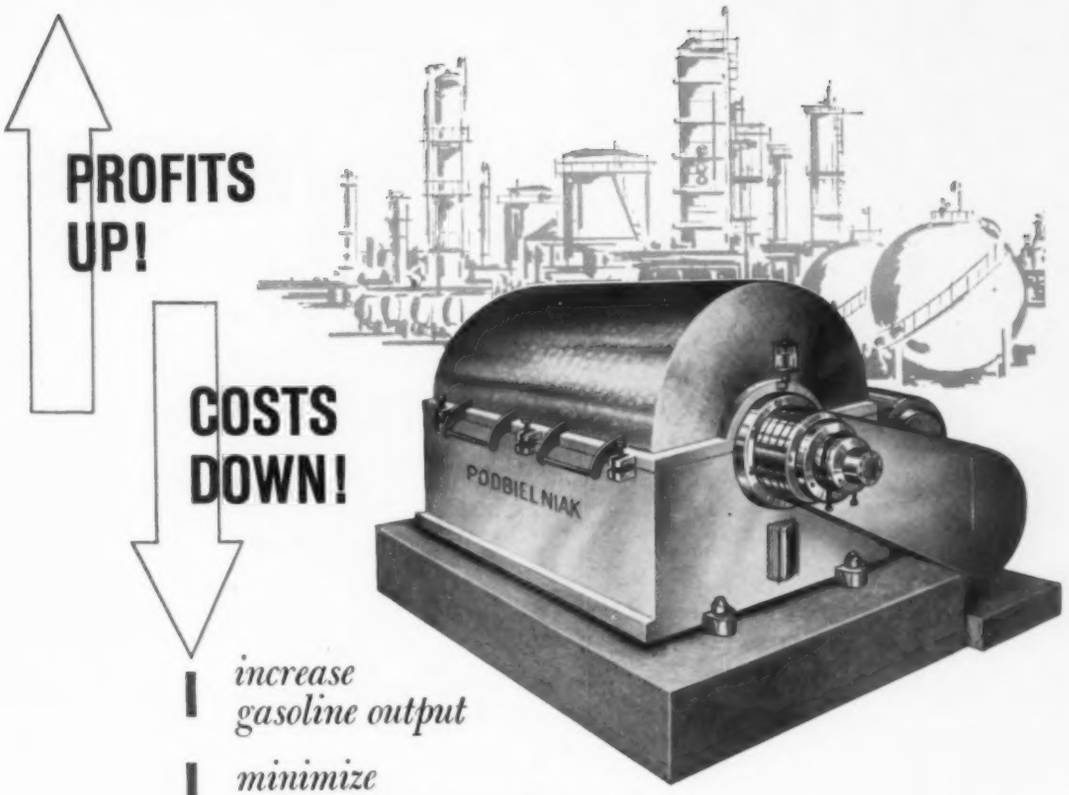

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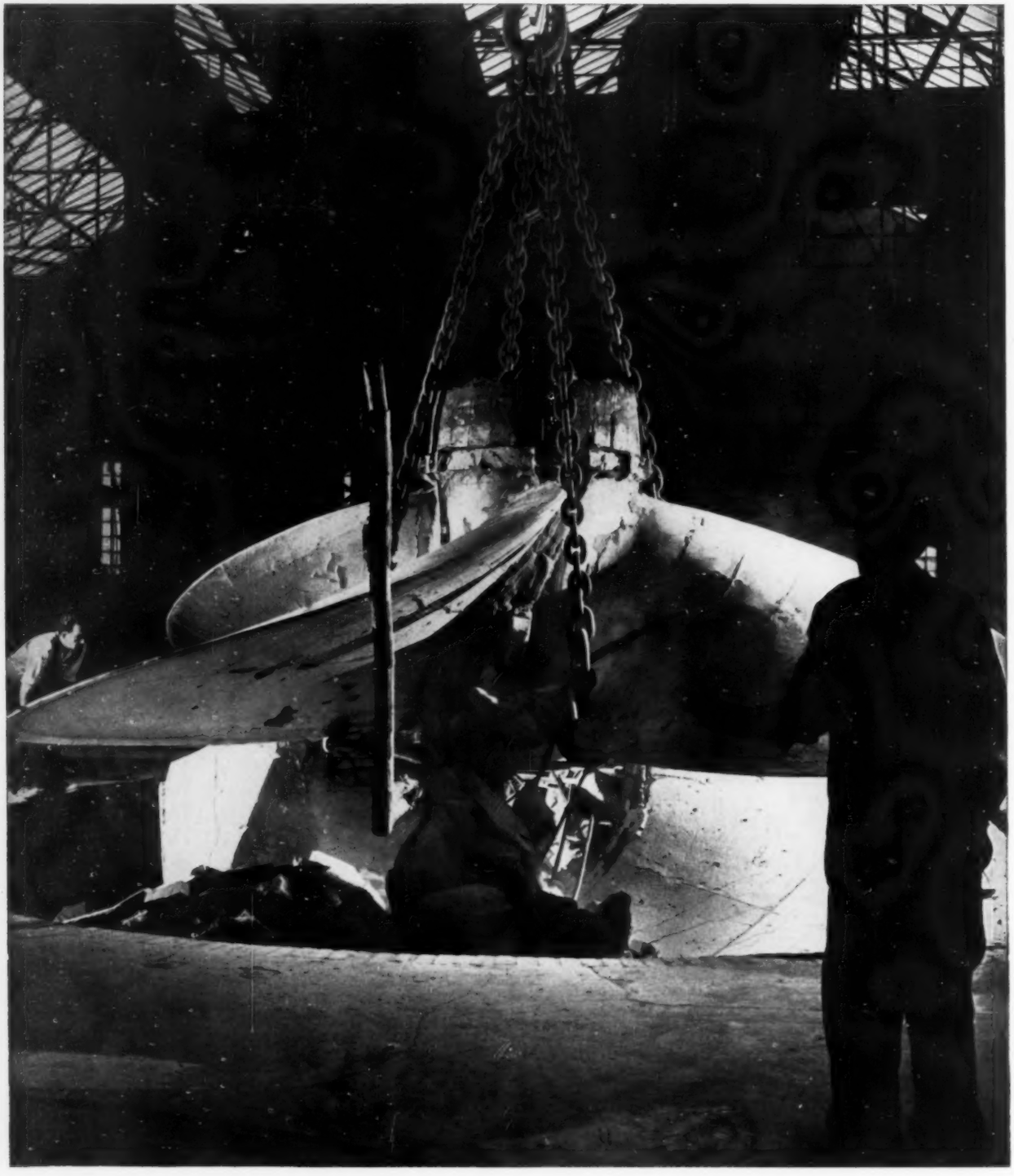

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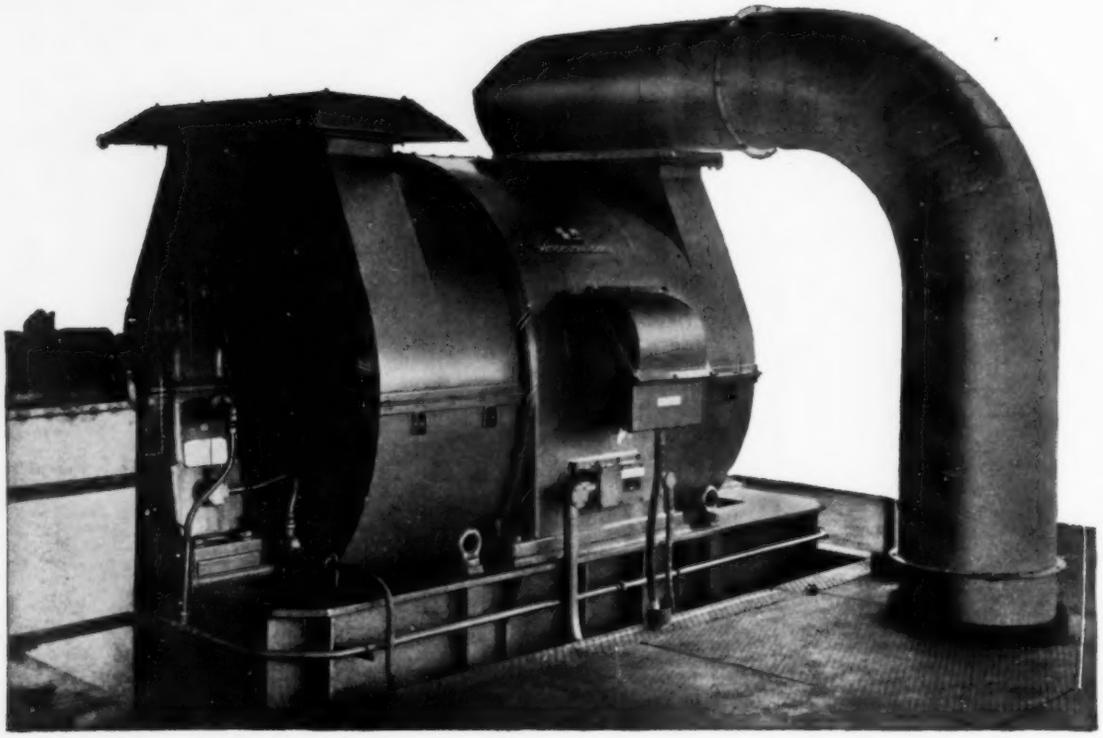

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Esso Petroleum Company, Limited, 100,000 BPSD refinery at Milford Haven, Wales. Engineering-contractor: Foster Wheeler

The Invisible 100,000 BPSD Refinery

This sky-silhouetted partial view of the new Esso Petroleum Company Limited 100,000 BPSD refinery at Milford Haven certainly appears to be quite visible. But the fact is that it is virtually invisible from the nearest highway or from the nearby sea. For important economic and civic considerations, the installation was in effect designed *into* the rolling hills of Milford Haven. Fully automated, the refinery produces gasoline and fuel oil in six process sections. As many as ten motor fuel components may be blended by remote control.

Shown above on the left are the crude distillation facilities and on the right, the powerformer processing area. A 500 million Btu/hr Foster Wheeler direct-fired heater . . . one of the largest of its type . . . serves the crude distillation unit. Facilities also include a T-shaped marine terminal extending 3500 ft. from the shore reaching a water depth of 50-70 ft. to accommodate the largest super-tankers.

To integrate this "grass roots" refinery with surrounding communities, over 75 storage tanks and spheres were placed on terraces and heater stacks were breeched into three 300 ft. main stacks to eliminate air pollution. To guard against water pollution, a separator with a 10 million gallon pond was constructed.

As in more than 800 process installations before this one, Foster Wheeler's engineering and construction services have provided the experience, ingenuity and technical competence needed to meet unusual project requirements. Here is more evidence of Foster Wheeler's ability to serve you, whatever your requirements . . . large or small . . . anywhere in the world.

Heat Engineered products, plants and processes . . . for the world's industrial progress.

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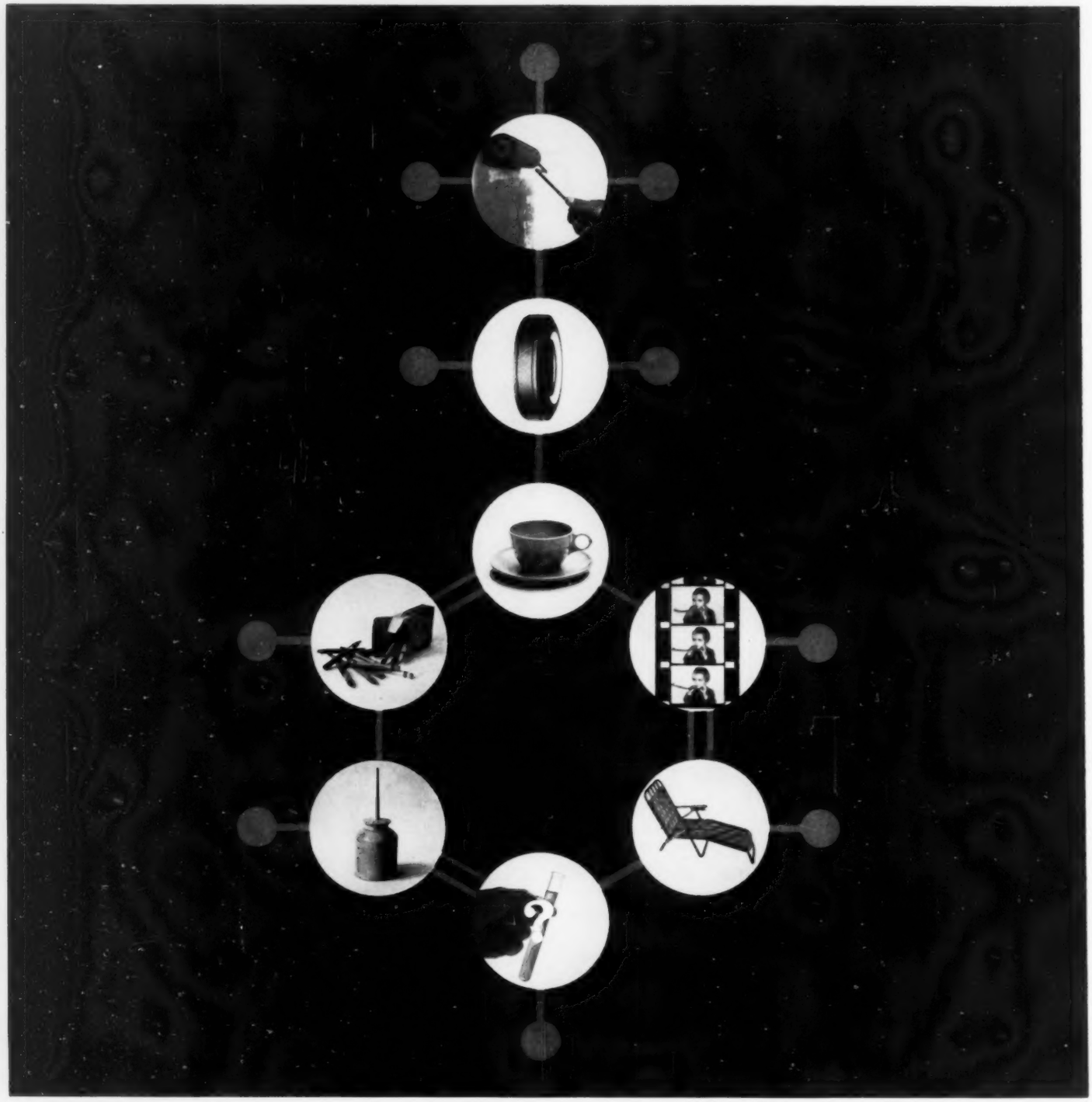

"More than three thousand different hydrocarbon compounds have been produced from oil and natural gas. So far, some three hundred of them are commercially important. But scientists believe there are many more useful hydrocarbon derivatives still to be discovered. Out of this test-tube cornucopia will come a multitude of new products to meet the expanding needs of tomorrow."

— M. J. Rathbone, President

Esso

Standard Oil Company (New Jersey)

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PETRECO DISTILLATE TREATING

gives refiners *better quality*

Refiners everywhere have found that they can depend on ELECTROFINING* Precipitators and the BENDER Catalytic Sweetening Process to meet the ever-growing demand for higher quality. These versatile units—designed, installed, and operated according to Petreco specifications to meet various purification problems—provide important *extra* refining steps that improve a wide variety of petroleum products.

Petreco ELECTROFINING Precipitators purify various distillates, from light naphthas to lubricating oils, through the combined use of appropriate chemical reagents and the coalescing forces of an electric field. An ELECTROFINING Precipitator installation occupies less ground space—and requires fewer pumps, pipes, and vessels—than any other treating system providing comparable results. Operation is automatically controlled to assure maximum purification and trouble-free performance.

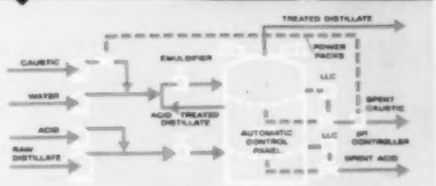
BENDER Catalytic Sweetening units effectively treat middle-range distillates by converting mercaptans to disulfides through oxidation. This process (using PETRECO* Catalyst) is simple, continuous, and automatic, with no product loss or air pollution. Compact BENDER units can be installed and operated at substantial savings in capital outlay and operating expenses, as compared with conventional sweetening methods. Treated distillates are fully able to meet doctor and corrosion tests.

Petrolite also offers other processes and chemicals for use throughout the petroleum industry. These include PETRECO* Desalting, Dehydration, Desaponification, and Sediment Separation, as well as TRET-O-LITE* Demulsifiers and Desalting Chemicals, KONTOL* Corrosion Inhibitors, SOLVO* Paraffin Removers, FLUDEX* Water Flood Additives, and S. P.* Scale Preventives. The Petrolite research and development staff will welcome an opportunity to determine the proper treating required for your particular needs. Contact your nearest Petrolite engineer. He is available for service, inspection, and advisory assistance—anywhere in the world.

** Registered trademark, Petrolite Corporation*

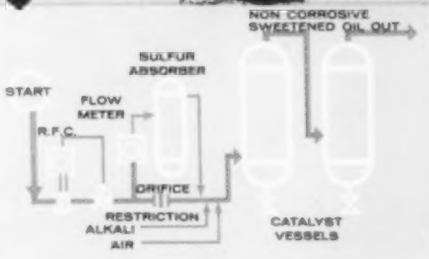
One type of ELECTROFINING Precipitator installation.

ELECTROFINING Precipitator flow diagram for typical acid-caustic treating.



BENDER sweetening installation comprised of two sulphur absorbers and catalyst vessels.

BENDER Catalytic Sweetening Process flow diagram.



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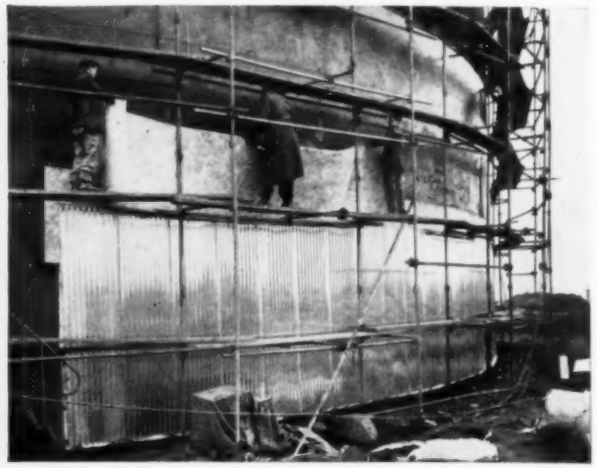
If you want the benefit of ESSO's experience of insulating tanks . . .

LOOK AT THESE TWO PICTURES



They show the method of applying Crown insulation used on the tanks in the new Esso installation at Tynemouth.

First Stud-weld a series of pins to the surface of the tank.

Second Impale Fibreglass Crown insulation on these pins. Because of its high tear strength it will be supported by the pins indefinitely and without sagging.

Third Cover with light-gauge corrugated sheet metal impaled on the same pins and secured by caps crimped over the prepared ends of the pins.

This method is not only effective and good looking but inexpensive. It does away with the separate framing otherwise necessary, and holds the insulation securely to the tank itself. You can learn more about the advantages from . . . .

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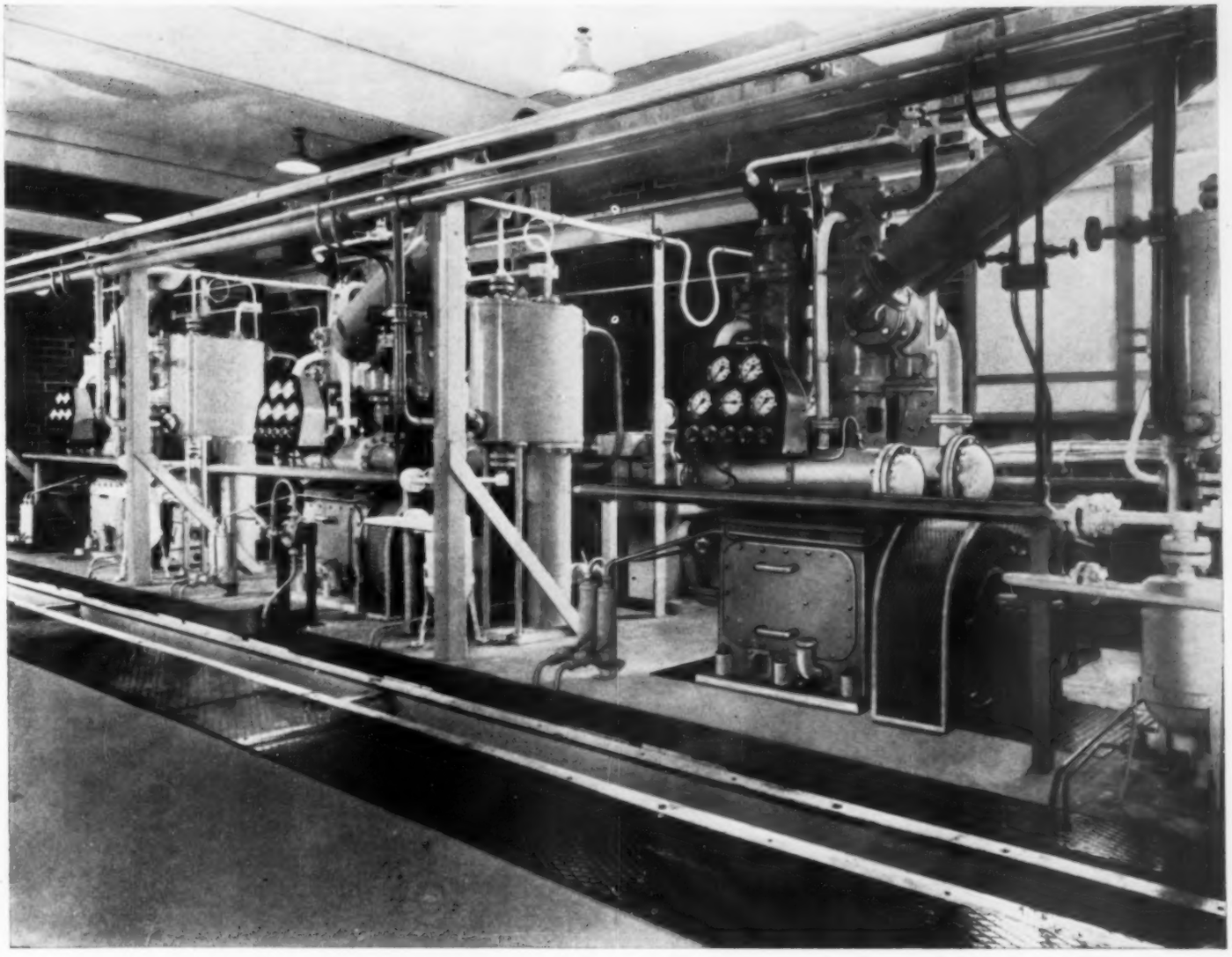

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Three Brotherhood two-crank four-stage compressors supplied to the University of Cambridge for a high speed wind tunnel installation.

Brotherhood compressors are designed to customers' exact requirements.

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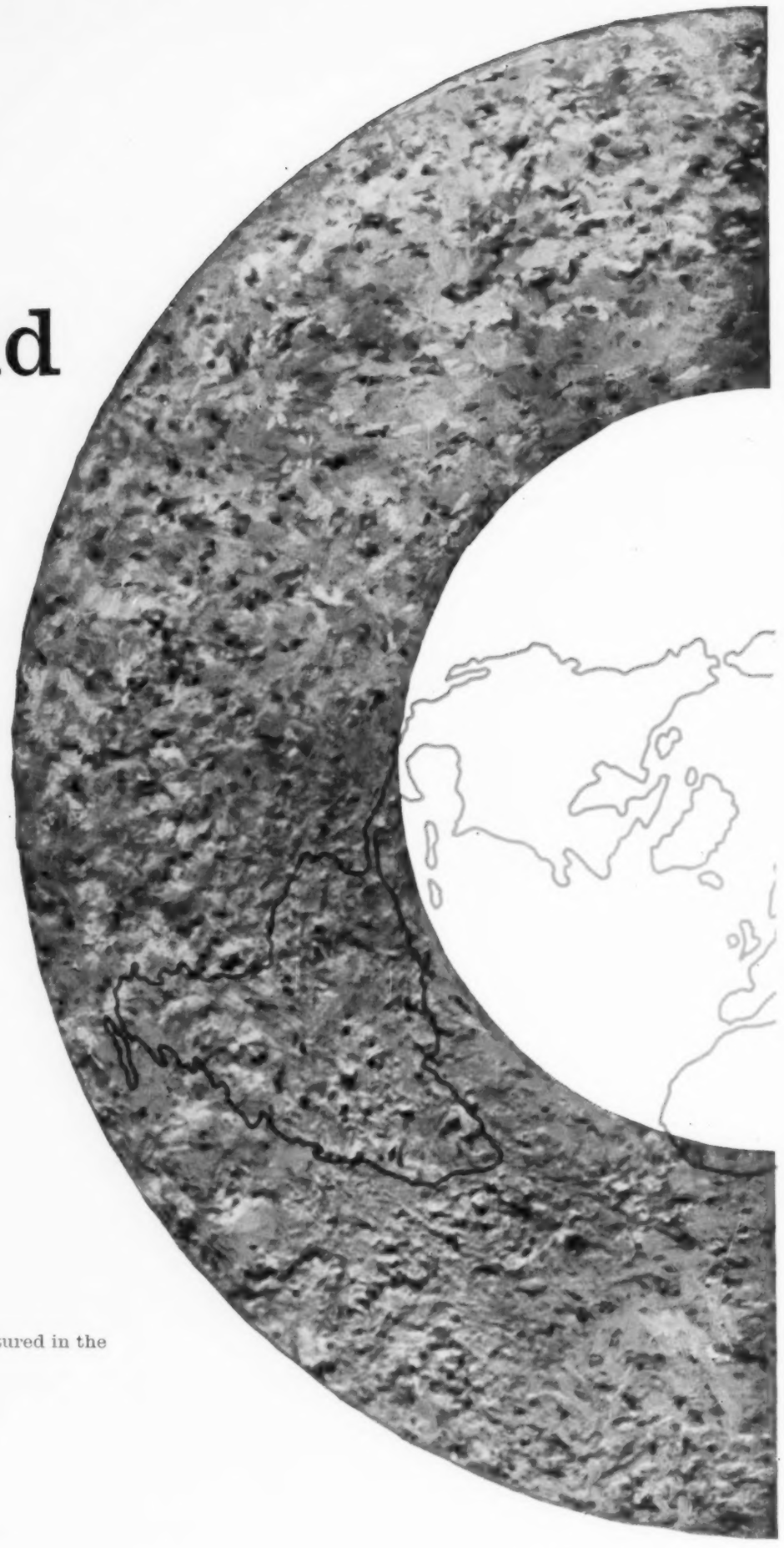

Caposite amosite asbestos moulded insulation is manufactured under supervision to the same uniform specification in all these countries.

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Australia
by James Hardie & Company Ltd.

France (as 'Isolamiante')
by Isolamiante SA

Italy
by Capamianto SpA

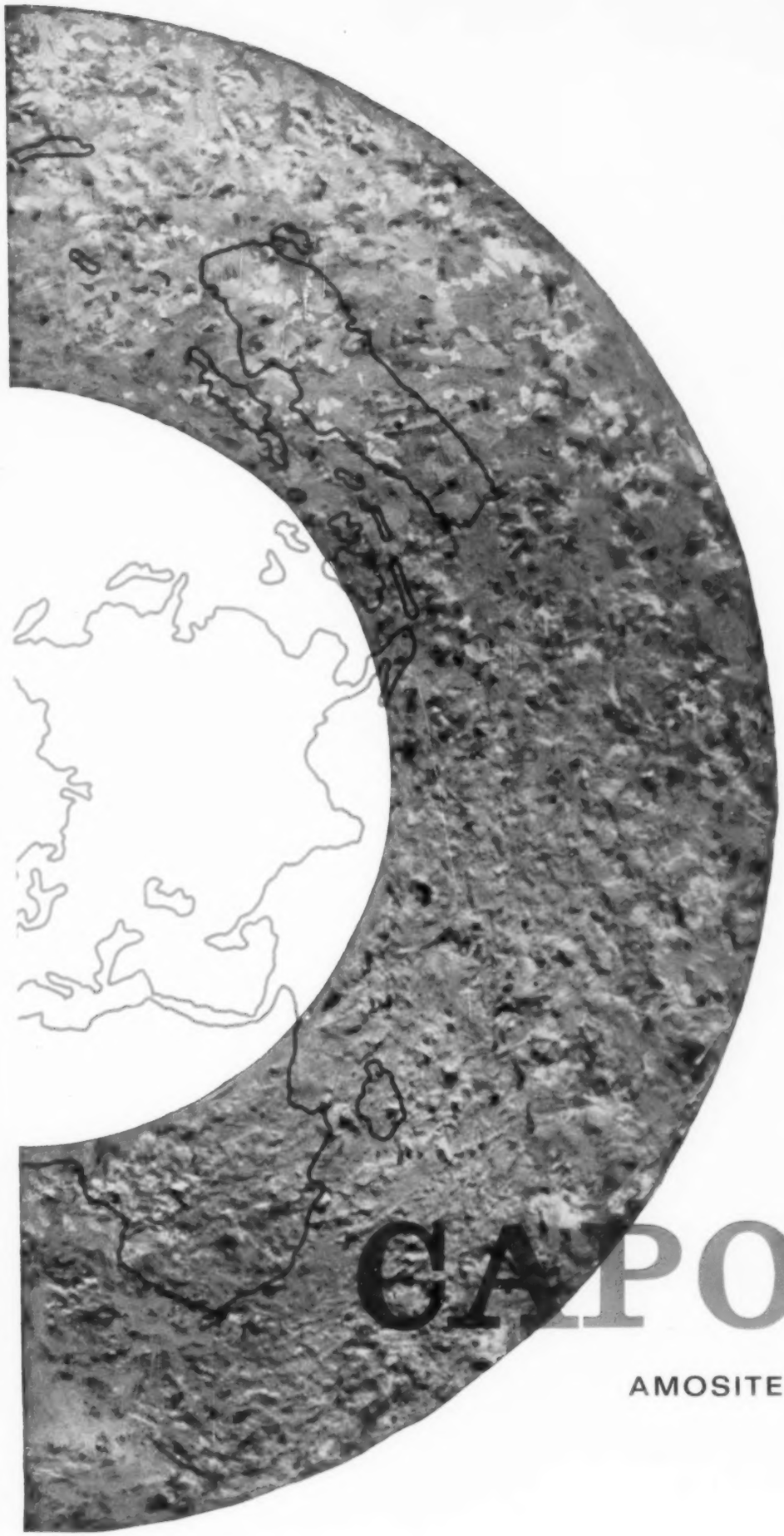
Holland
by J. de Boer & Company

Spain
by Messrs. Eduardo Rosa

Argentina
by Montisol Argentina SRL

Japan
by Nippon Asbestos Company

Amosite asbestos insulation is also manufactured in the **U.S.A.** under the name of 'Unibestos'
by Union Asbestos & Rubber Company



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4 x 4 Power Wagons

W100 TOWN WAGON
Six or eight passenger models with 140 HP six cylinder or 200 HP V-8 engine, 114" wheelbase 6,000 lbs max. G.V.W.

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Available as chassis-cab with 125 HP six cylinder or 202 HP V-8 engine, 157 or 175" wheelbase 20,000 lbs max. G.V.W.

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Petroleum companies operating all over the world need other vehicles than trucks designed for highways. In the wide open spaces of the desert or in the swamps and jungles of the Far-Eastern countries, they depend upon vehicles that are built to endure the worst imaginable conditions. Sturdiness, power, dependability and versatility are imperative requirements of the trucks used for prospecting and in oilfields.

The Chrysler Corporation has always made an important contribution to the petroleum industry. Dodge, Fargo and De Soto 4 x 4 Power Wagons are the most talked-about vehicles of their kind. They have gained a unique reputation built upon ruggedness in every inch, on exceptional dependability and on outstanding and lasting performance. They promise—and they render!—years of heavy-duty, trouble-free service!

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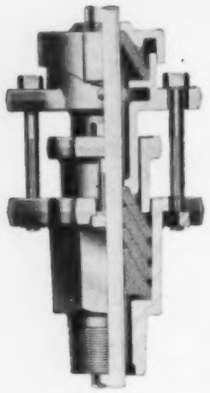
HERCULES CONE PACKED STUFFING BOXES

Provide the ultimate in SAFETY, ECONOMY and EASE of operation

Hercules Stuffing Boxes — like all Hercules Products — are improved constantly to meet the changing needs of the industry and are available in three styles. They are used internationally and are available through supply houses, everywhere.

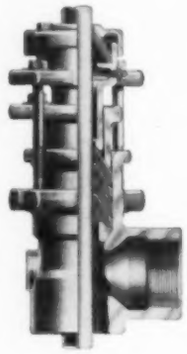


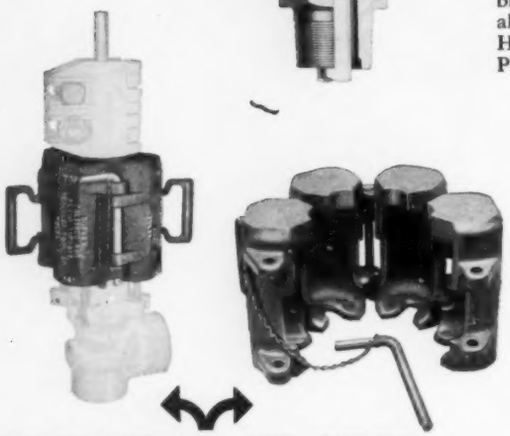
HERCULES REGULAR TYPE DUPLEX STUFFING BOX

More efficient operation with fine adjustment possible. Offers longer packing life due to ability of Packing and Glands to follow lateral movement of Polished Rod. Malleable iron construction prevents breakage if rods are accidentally dropped on Stuffing Box. Has male thread to screw into Pumping Tee.

HERCULES TEE TYPE DUPLEX STUFFING BOX

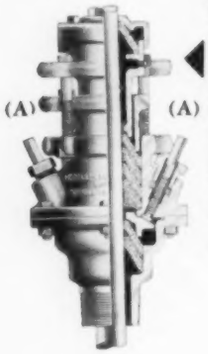
A combination Tee and Stuffing Box only 15" high. Eliminates one threaded connection between Stuffing Box and Tee. Full opening — allows rods to be run or pulled without removing Stuffing Box body. Has female thread to screw directly onto tubing.





HERCULES POLISHED ROD CLAMP-OFF SUPPORT

Used with Hercules Regular and Tee Type Stuffing Boxes to *prevent accidents* or personal injuries while clamping off. Manufactured from high tensile aluminum alloy, will safely support 30,000 lbs. weight.



HERCULES TYPE DP (Double Packed)

Duplex Stuffing Box for use on high pressure or intermittently flowing wells. Allows Main (upper) Packing to be safely and easily replaced while well is under pressure. The two compression bolts (A) are turned clockwise until the lower Packing seals off. The Main Packing can then be removed and replaced.

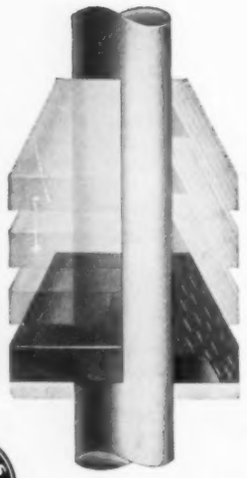
HERCULES OIL RESERVOIR GLAND

All Hercules Stuffing Boxes may be equipped with *Oil Reservoir Upper Gland* on *problem* wells which pump off and burn packing. The polished rod runs through the Reservoir, and is cooled and lubricated by its fluid.

For Best Results in Hercules Stuffing Boxes, use only

HERCULES CONE-SHAPED PACKING RINGS

Each set of Hercules Cone-Shaped Packing Rings now include the NEW, SOLID Split Bottom Cone Packing Ring. This new solid ring provides greater contact with the polished rod and a more substantial base for the upper Packing Rings, resulting in *longer* packing life and superior performance. A complete set now consists of three *regular* and one new split *Bottom Cone* Ring.



THERE'S A TYPE SPLIT CONE PACKING RING FOR EVERY REQUIREMENT:

Hercules Split Cone Packing Rings come in four grades: SOFT, HARD, SPECIAL LUBRICATED and HEAVY DUTY. SOFT Rings are always used with bronze liners or with steel polished rods in wells which are not always pumping fluid. HARD Rings are recommended for steel polished rods only, and where fluid is constantly being pumped. SPECIAL LUBRICATED Rings are recommended for problem wells which pump off persistently. When well is pumped dry, the rings lubricate the polished rod and prevent the packing from burning until fluid is again present. HEAVY DUTY Rings are recommended for problem wells. Properly adjusted, they give phenomenal life.

ACCEPT NO SUBSTITUTES

Ask for and accept only Hercules Cone-Shaped Packing Rings for use in all HERCULES Duplex Stuffing Boxes. All HERCULES Products are available through Your Supply Store.

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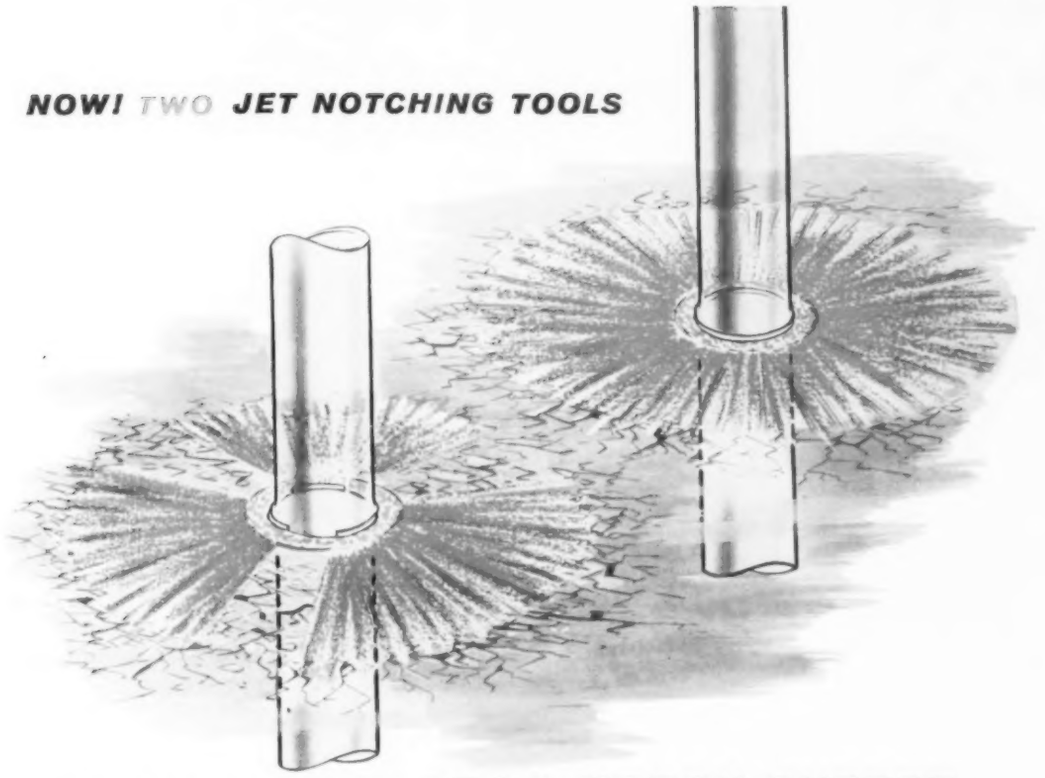
NOW! TWO JET NOTCHING TOOLS



McCULLOUGH FRAC-NOTCH CUTTER
AND NEW TRIPLE FRAC-NOTCH CUTTER

McCullough's new Triple Frac-Notch Cutter, companion tool to the widely used Frac-Notch Cutter, is gaining extra production for operators wherever hydraulic fracturing is required for well completion or stimulation.

Where the Frac-Notch Cutter produces a full circle, horizontal notch around the well bore, the new Triple Frac-Notch Cutter makes three separate notch cuts simultaneously at the same depth in the well, on a single run. Each notch cuts through casing and cement and cuts and fractures as much as 15" into the formation. *A segment of uncut casing is left between each notch.* When hydraulic pressure is applied the formation is fractured between each notch, giving the effect of full-circle fracturing.

The McCullough notching process is the most effective of all single-point entry methods of fracture initiation. The enormous power of the cutting process notches into the formation and also fractures the formation for some distance beyond the face of the actual cut. Thus, lower hydraulic fracturing pressure is required for initial breakdown, a greater area of formation is more effectively fractured and the flow capacity of the treated formation is greatly increased.

Check with your nearest McCullough Service Location! This process can gain you substantial production increases.

Sizes available for: 4½", 4¾", 5", 5½", 5¾", 6⅝" and 7" OD casing. (The Frac-Notch Cutter is also available for 2", 2½", 3" and 3½" tubing.)

UP TO 100 TIMES MORE EFFECTIVE FRACTURING POWER

CAN IMPROVE PRODUCTION AS MUCH AS 30 TIMES

REQUIRES LESS RIG TIME

ACCURATE PLACEMENT OF NOTCH

VERY ECONOMICAL

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BREAKING THE BARRIERS OF INNER SPACE

Formation testing has long played an important role in profitable production of oil and gas. As the search for production has gone deeper and deeper in the inner space of the earth, Halliburton's skilled research and development teams have opened new avenues through improved formation testing methods to find this production.

In its ultra-modern Research and Development Center, Halliburton provides complete facilities — executive encouragement — and valuable incentive to the highly skilled scientists, engineers, and technicians who are dedicated to the constant improvement of testing tools and techniques.

As a result, whenever you call upon your Halliburton Tester, you can rely on him to deliver top testing performance — performance that comes only with this kind of team effort behind it.

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Reserves and Exploration

There is a great glut of oil. We have enough oil for all the foreseeable future. In a few years, oil will lose its market to atomic energy and to the fuel cell. What strange talk from what strange prophets! The U. S. today has about a 13 year reserve of oil. This was also true in 1925. After 35 years of ever increasing effort, using an ever improving technology, exploration has barely succeeded in staying even. Fifteen years ago, the U. S. had 31 years of gas reserves; today the figure is 20 years; soon it will be 15 years. Exploration has lost, and will continue to lose the battle to maintain gas reserves in the U. S. Perhaps so, say the prophets of glut, but look outside the U. S. Here exploration has been far too successful. Look at Venezuela, Saudi Arabia, Kuwait, Iraq, Iran, Libya, Algeria; here is the great glut of oil.

Yes, the hunt in these countries has been successful—remarkably successful, because in the last 15 years the oil industry has gone into new areas and has made intensive application of a highly developed exploration technology. Look into the future; can you see exploration history repeating itself? Where will you find new oil areas of such great size; and why are you so sure that exploration technology can be even more highly developed? Isn't it probable that we have just passed the highest peak in the exploration success cycle?

Is there a world-wide glut of oil? A few years ago, the reserve figure for the free world was 41 years. Today the figure is 36 years, and free world production is increasing at about 10 percent each year. If now the successes of the past 15 years cannot be repeated, and if free world production continues to increase by 10 percent each year, how far will the reserve figure fall in only a few more years?

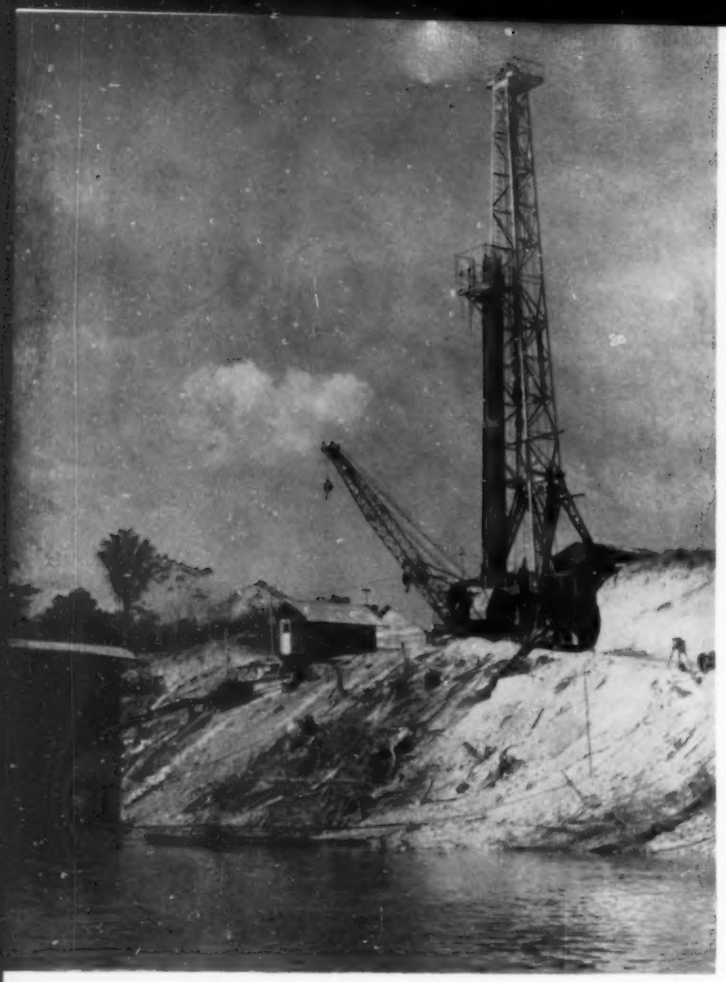
There is no glut of oil. On any long range basis, and long range means only a decade, the lack of adequate reserves is alarming. There is the capacity to overproduce. It is all too easy to establish excessive production capacity. Oil is unique; it will flow out of the ground; other minerals must be dug out. Too many wells have been drilled, and there have been strong pressures to force this drilling. The oil industry is placed under obligation by various people and by various governments to generate what they consider appropriate revenue, and if such revenue decreases, the pressure on the industry increases.

The result of excess producing capacity has been financial difficulty. The industry has met financial difficulty by cutting expenses. Many of the cuts have been made by finding ways to operate more efficiently. Some of the cuts have been made by decreasing or deferring exploration effort. This is a form of borrowing from the future; it is a way of buying this year's profit on the installment plan. A few years from now, the installments must be paid in the form of sharp increases in the exploration effort. A few years from now, it will be more evident that free world reserves are inadequate. A few years from now, there will be no large new areas to be explored for the first time. Then the demands made upon exploration will be greater than we can meet. These demands will come at a time when many experienced men have left exploration. They will come at a time when new geologists and new geophysicists cannot be found, because today the number of geological and geophysical students in our colleges has become far too small to meet the needs of the future.

We are only a few years away from the day when exploration will be required to take an inadequate supply of technical men, explore areas which have already been explored one or more times, and find oil at a faster rate than we have ever found it before.

J. P. Woods

The Atlantic Refining Co., Dallas, Texas, and President, Society of Exploration Geophysicists



Stratigraphic test on the edge of the Rio Acazi, by Petrobras.

Link reports on Brazil

A highly unfavorable report on Brazil's oil prospects has been published in the Brazilian press. It is a direct translation of the report by Walter Link, an American geologist who was hired by the Brazilians to direct their oil hunt.

In 1954 the newly-created Petroleos Brasileiros, known as Petrobras, hired Walter Link, former chief geologist for Standard Oil Co. (New Jersey) to head its exploration effort. The petroleum prospects of the country were virtually unknown, but the known sedimentary area was known to be huge, over one million square miles, and it was felt that some oil must be found in this vast area.

In a wave of nationalistic fervor, exploration and production in Brazil were made a monopoly under Petrobras, created in 1953. Thus the whole of this vast and unknown territory has been explored by that single company. Little oil experience existed in Petrobras management. Of the four directors of the company who guided operations during 1960 not one had any experience in oil, in fact none of them have any experience in business of any kind.

With the help of expert technicians, however, a huge exploration campaign was mounted during the five years of 1955 through 1960. Mr. Link, who came to the end of his tenure at the end of 1960, submitted a confidential report to the Board of Petrobras on the work accomplished. This report leaked to the press, evidently in its entirety, since it was published in verbatim form.

Because of the unique importance of this report, it has been translated and forms the basis of this article.

In his report of August 22, 1960, Mr. Link had this to say, following his description of the basin ratings contained in the accompanying table:

"On this basis, we find that the Sergipe Land area has a B+ rating and full-scale exploration should continue. The Middle Amazon has a C+ rating and exploration should continue on a reduced rate. Barreirinhas, Maranhao, Alagoas Land, and South Brazil are either straight C or lower, but higher than 'D.' The oil possibilities

BRAZIL—Final Basin Ratings by Petrobras Geologists

	McCreight	Bowman	Fr. Gomez-blange	Sanford	Blankenn	Fernandes	Link	Average	Excluding Link Rating
Lower Amazon	C	D	D	D	D	D	D	3.85 D	3.83
Middle Amazon	C+	B—	C	C	C	B	C	2.8 C+	2.88
Upper Amazon	C	C	D	D+	D	C	D	3.5 C—	3.4
Acre	C	C	D	D	D	D	D+	3.1 D+	3.68
D. Luiz Maranhao	C—		C—	D	D	D	D	3.6 D+	3.3
Barreirinhas Maranhao	C+		C	C	C	C	D	3.1 C	3.9
Maranhao Sergipe	C		C—	C	C	C	D	3.2 C	3.04
Land Alagoas			B+	B	B	B	C+	1.9 B+	1.92
Land Esp. Santo			C+	D	C	D	D+	3.4 C	3.10
South Bahia			D	D	C—	C	D	3.8 D	3.58
South Brazil			C—	C	C	C	D	3.4 C—	3.2

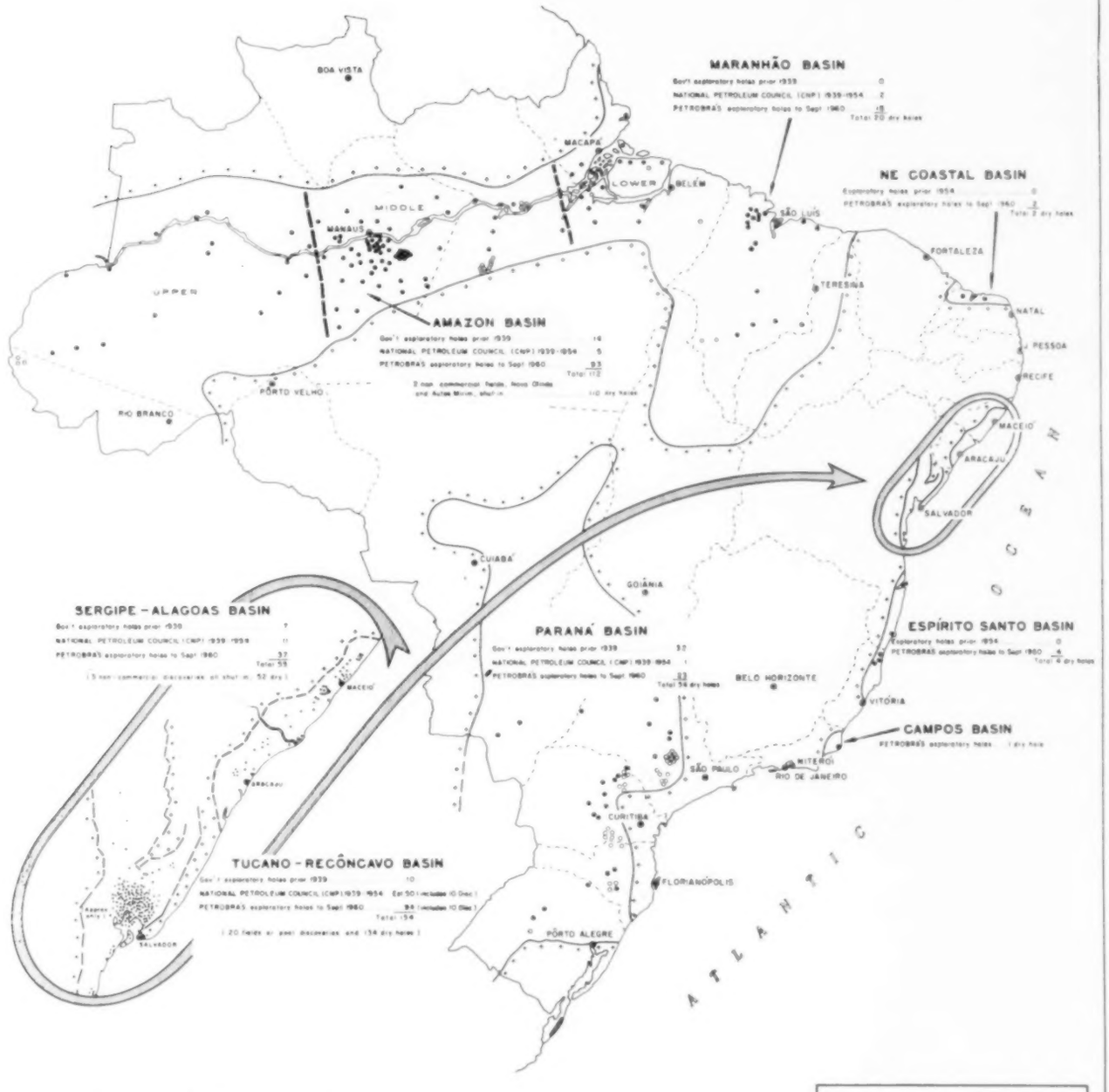
The above ratings were compiled by Petrobras geological staff. They accompanied a report to the board of Petrobras dated 22 August 1960, submitted by Walter Link, former head of the Exploration Section. He defined an "A" basin as one in which there is commercial production, and where exploration should be continued. A "B" basin is one that has all the requisites present and in which geological factors indicate that commercial oil should be found, and warrants continued active exploration. A "C" basin is a marginal basin in which a great deal of exploration has been done and without commercial success. Such basins call for curtailment of exploration and not necessarily cessation entirely. The "D" basin is one that is considered as having no possibilities and exploration should cease. For mathematical averaging, A equals 1; B equals 2; C equals 3; and D equals 4.

BRAZIL

TOTAL EXPLORATORY WELLS DRILLED

● DRILLED BY PETROBRÁS

○ DRILLED BY FEDERAL GOV'T AND NATIONAL PETROLEUM COUNCIL (CNP)



BRAZIL—Wells Drilled Per Federal Unit

Years	Acre	Amazonas	Para	Marantam	Rio Grande do rarte	Alagoas	Sergipe	Bahia	Espirito Santo	Rio	Sao Paulo	Parana	Santa Catarina	Rio Grande de Sul	Mato Grasso
1939-57	2	6	7	8	2	10	4	574	—	—	1	5	—	—	—
1958	—	17	2	5	—	8	1	101	—	—	2	3	1	—	—
1959	—	24	11	4	—	14	2	162	—	—	2	2	1	1	1
Jan/April 1960	—	5	—	1	—	4	2	59	1	—	—	—	1	2	—
Totals	2	52	18	18	2	36	8	896	2	1	6	10	2	3	1

cannot be considered favorable and the chances of finding the bonanza oil that Brazil needs are very poor. The Lower Amazon, Upper Amazon, Acre, Sao Luiz, and Espirito Santo Land, all are D+ or lower and exploration should be discontinued.

"When these discussions were finished and the concensus of opinion charted and averaged, it was obvious to all that the Brazilian Paleozoic basins, particularly, were very low-grade exploration territory, and that the continuation of exploration in regions of such low rating must be a decision made by management."

In a report to the Petrobras board dated August 9, 1960, and headed "1961 Exploration Program." Mr. Link had the following to say:

"Attached is the proposed exploration program for 1961 which recommends the continuation of exploration at the 1960 rate in Sergipe and Reconcavo basins, and increasing activity in the Tucano basin.

"No exploration in the 'D' basins of Acre, Upper Amazon, Lower Amazon, and the Coastal Plain of Espirito Santo and South is considered.

"We also feel that exploration in the 'C' basins such as the Middle Amazon, Maranhao, Barreirinhas, Alagoas, and South Brazil is indefensible from a geological standpoint. The program outlined for these areas is not a recommended program. It has been included as a basis for 1961 exploration in case management wishes to disregard the marginal prospects and decides to explore in these basins for other than geological reasons.

"Since the 1961 program will be carried out without my services, it should be the program of the men who are here and who will direct it. I was present during the formulation of the program and agree that the Sergipe, Reconcavo, and Tucano programs are sound.

"On August 22nd I sent the Board my memorandum on the Brazilian basin ratings under cover letter DEPEX-1032. You will note from this memorandum that my ratings of the basins are constantly lower than those of the other geologists. To me a 'C' basin is so marginal, and particularly if it has been sampled over a wide area by exploration surveys and drilling, that I would cease exploration in them, and without question in the 'D' areas.

BRAZIL DRILLING REVIEW
(1939 to 1960)

Years	Wells Drilled	Oil Producers	Gas	Dry	Injection
1939-57	647	377	40	229	—
1958	111	72	—	26	14
1959	227	127	—	100	—
Jan/April 1960	75	48	—	26	—
Totals	1,060	624	40	381	14

"Using the *Consultoria Economica's* compilations of foreign exchange spent for exploration from 1955 through 1958 as a base, and excluding the money spent in the Reconcavo, it is reasonable to any that by the end of 1960 about US $100,000,000 will have been spent for exploration and drilling in the non-producing basins of Brazil. I would hazard a guess that another US $100,000,000 was spent in Cruzeiros. Since Petrobras obtains its dollars at about 50% of the free market rate, the actual US$ 100,000,000 becomes US$ 200,000,000 on a competitive basis. Petrobras has, therefore, spent the equivalent of US$ 300,000,000 in the past six years for exploration in the non-productive area, without finding a single commercial oil field.

"Since the beginning of seismograph work by C. N. P. in the Middle and Upper Amazon in 1947, 510 crew months will have been done in these Paleozoic basins by the end of 1960. Placing an average figure of US$ 60,000 per crew-month, this work has cost US$ 31,300,000. This work has not uncovered a single drillable prospect, either because there are no major structures or because the structures are of such small magnitude that present-day seismograph tools and techniques are not sharp enough to map structures in sedimentary areas that are covered by lava flows, or have diabase intruded into the sediments. The conditions in the Paleozoic basins of Maranhao and South Brazil are the same. In my opinion, seismograph work in these areas is a waste of money, as present-day techniques cannot solve the problem. Perhaps five to ten years from now the problem will be solved by advancement in these techniques.

"Since the seismograph, gravimeter, and airborne magnetometer exploration tools have not been able to find structures in the three Paleozoic basins, the Board should understand that any drilling in them now being conducted, or any projected for 1961, cannot be classed as wildcatting but must be placed in the category of stratigraphic and structural drilling.

"The only Paleozoic basin that was given a 'C' rating or higher by all geologists is the Middle Amazon basin. The free oil found at Nova Olinda and Autaz Mirim undoubtedly has a lot to do with this. We all consider a 'C' rating as marginal.

"With the backlog of geological knowledge gained by exploration in these basins since 1954, and the gradual downgrading of the oil potential of these as more information was obtained, it is impossible to recommend continued exploration in these areas, as we should only be interested in commercial production. Until late 1953 this large-scale exploration was justified because up until that time the basins could not be evaluated due to insufficient data. In DEPEX letter and memoranda LO-495 of July 15th 1958, and again in DEPEX-848 of August 12th 1959, I informed management that the oil prospects were dwindling rather than improving. Subsequent work has unquestionably borne out this contention, and today very little remains to justify further exploration in these Paleozoic basins.

"It might be said that we have stretched our technical conscience and our scientific morality to the breaking point by grasping the few favorable geological straws and using them to justify continuation. This past year we have learned nothing different, or found anything new that gives any hope. The good that could come from continual exploration would be mostly academic and for added geological information. It would give a clearer subsurface geological picture that might strengthen or refute some geological concepts. Since the cost of this is very high and has little promise of generating anything economically useful, we cannot recommend such expenditures.

"The men who hired me in 1954 were clear and explicit in emphasizing that they wanted exploration done as any good commercial oil company would do it. This has been done to the best of my ability, and we have employed every known method and exploration tool known to the industry. At no time during these six years has management received anything except a straight answer and a constant flow of exploration progress whether it was good or bad. I presume this concept of DEPEX function remains the same as no one in management has requested me to change it.

"I doubt that any commercial oil company would continue exploration in these Paleozoic basins, or that they would take up lands and begin an exploration project if they knew the geology and exploration results as intimately as we do. My recommendation and advice is to discontinue exploration in the Paleozoic basins at the end of this year. If, however, Petrobras wishes to remain in large-scale oil exploration on a competitive basis with the world oil industry, and has the money to do so, I suggest Petrobras go to some country where concessions can be obtained and where the chances of finding oil are good. The company should not enter any area unless it has an 'A' to 'B+' rating." END

Venezuela's oil decline

by Neal Van Middlesworth
Venezuelan Oil Scouting Service

Production rose 2.7% in 1960, but wells drilled declined 38%, rigs operating were down 37%, field parties were only 20% of 1959

THE GENERAL STATE of operations in 1960 is illustrated by the accompanying table by quarters, which shows a continuation of the decline which has characterized Venezuelan operations in the last three years.

Production: Industry production totalled about 1,039,000,000 barrels for the year, or 2.7% more than in 1959. All time records established by individual operators (based on weekly reports) were as follows: Mobil, 158,000 b/d; Venezuelan Sun, 94,000 b/d; Superior, 81,000 b/d; Phillips, 70,000 b/d; Venezuelan Atlantic, 50,000 b/d.

Cumulative production has now reached approximately 13,969,000,000 barrels. Reserves were estimated at 17,451,000,000 barrels at the beginning of 1960, and no later figure is available.

Wells: Wells drilled for oil in 1960 totalled about 433, 38% fewer than in 1959. Of the total, 52 were wildcats, 381 were development and outpost wells. In addition, 4 service wells were drilled, 2 old wells were deepened, and 37 old suspended wells were brought to final status (usually abandoned).

Rigs: Rigs in operation (excluding about 35 on workover and repair) averaged 42, about 37% fewer than in 1959. The average on wildcats was 11, on other wells, 31. About 33 rigs were active at the beginning of 1961.

Field Parties: Field-party activity, with an average of 4 parties in the field, was down about 80% from 1959. The last geophysical party exploring for oil was laid down at the end of June. The only activity for the last six months was carried on by surface geology parties.

Concessions: In 1960, the companies renounced 191,090 hectares of exploration concessions and 839,737.63 of exploitation concessions, for a total of 1,030,827.63 hectares, or over 2.5 million acres. Renouncements since January 1958 have now reached a total of 1,960,823.18 hectares, or 4.84 million acres. Lands still under concession in January 1961 totalled 4,718,444.-93.58 hectares (11.7 million acres), but this was 29.3% less than the 6,691,246.1129 hectares (16.5 million acres) held three years ago.

Trends: The precipitous decline in Venezuelan oil, which began in 1958 and apparently has not yet reached bottom, is demonstrated in the accompanying table. In it, every major index is headed for basement, except one — production — and this shows only relatively slight gains in the last two years, 6% and 2.7%, respectively. Compared with a world-wide production increase of 7.7% in 1960 (14% in the Middle East), Venezuela is losing ground.

General: A new collective labor contract was signed in February 1960 which, it was estimated, would cost the industry 110 million Bolivares per year during its three-year term, reducing an already attenuated profit margin by 3.5¢ a barrel. Union of California, which had maintained a listening post in Caracas for about two years, was making ready to shut down its office as the year ended. The Paria Operations group announced that it would suspend drilling in the Gulf of Paria, after an expenditure of $101 million for concessions and $28 million for operations which resulted in a number of dry holes and a very little oil. The oil companies continued to let personnel go (130 fewer geologists and petroleum engineers in December than in January), and service and supply companies cut staff and stores severely or left the country altogether.

Creole's fourth pressure-maintenance plant in Lake Maracaibo (capacity 150-mmcf/day) was nearing completion at year end. Shell started construction of a similar plant in the Lake.

Mobil's 50,000-b/d refinery near Puerto Cabello, which went on stream in June, brought Venezuela's total refining capacity to about 1-million b/d. The government's Petrochemical Institute inaugurated the second link in its proposed national gas-line network, an 80-mile stretch from Caracas to Valencia.

Corporación Venezolana de Petróleo, the national oil company, was decreed into existence in April and 138,000 hectares (340,000 acres) of concessions were turned over to it by the government, most of them prime Lake Maracaibo blocks surrounding productive areas. As the year ended, the company was preparing to invite bids on the construction of one or more drilling platforms in the Lake.

VENEZUELAN OPERATIONS—1960

	Production B/d	Wells	Rigs	Field Parties
1st qtr	2,861,700	147	49	6
2nd qtr	2,836,300	88	43	4
3rd qtr	2,892,700	105	41	2
4th qtr	2,792,400	93	35	3
Average	2,846,000	433	42	4

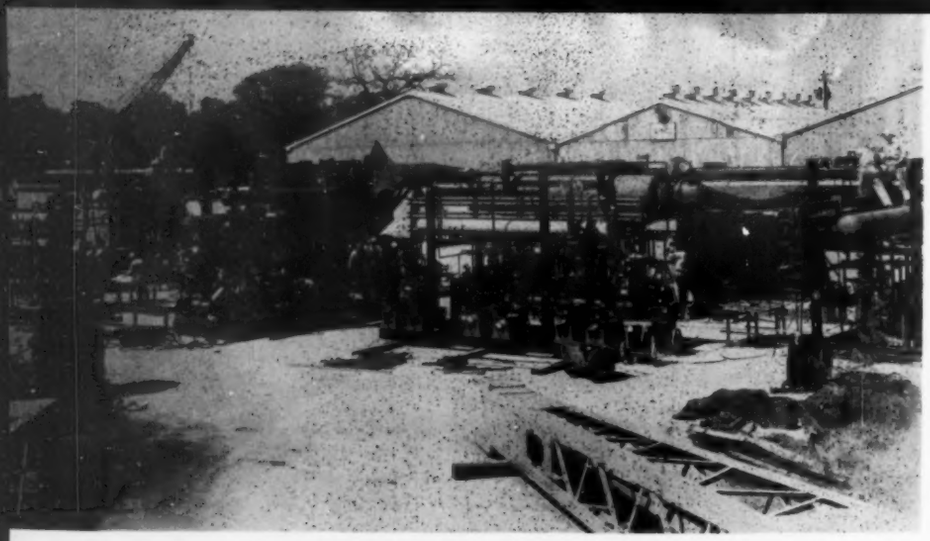
VENEZUELAN TRENDS IN OIL ACTIVITY

	Production B/d	Wells	Rigs	Field Parties
1960	2,826,000	433	42	4
1959	2,771,000	698	67	17
1958	2,606,000	1,193	95	35
1957	2,779,000	1,828	115	39
1956	2,458,000	1,452	104	34
1955	2,159,000	1,178	102	34
1954	1,896,000	830	103	—
1953	1,766,000	945	110	—
1952	1,805,000	1,322	100	—
1951	1,705,000	1,305	96	—

The policies of the Minister of Mines & Hydrocarbons drew heavy criticism from local commercial and financial sectors, as the national economy and the oil economy went sliding downhill together, but the government stated repeatedly that it was standing fast on its principles. One of those is that concessions should never again be let in Venezuela. At the moment, this is a largely academic question, but the implications have brought exploration in free zones to a standstill and halted any expansionist ideas on the part of the companies, most of whose concessions expire in twenty-two years and may or may not be renewed. Another principle is that Venezuelan crude may not be sold at discounts greater than 5 or 10% below posted prices, and that the government ought to set these.

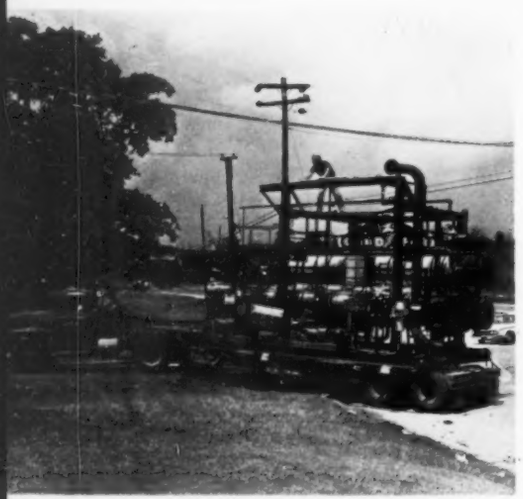
At year end, Venezuela was preparing to act as host to a meeting of the Organization of Petroleum-Exporting Countries, which is dedicated to the proposition that oil is too cheap, in relation to other forms of energy, and that prices can be shored up by the establishment of worldwide prorationing.

C. C. McDermond, who started an oil-scouting service in Maracaibo in 1925 and operated it for more than thirty years, died in the US at the end of July. END



Three of the skid-mounted units during assembly in the fabrication shops at Houston

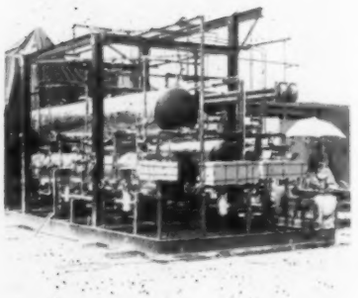
How a prefab refinery solved a construction problem in Guatemala



Left: Completed skid on tractor-trailer and on way out of yards

Bottom left: Two units, secured to deck of ship, enroute to Guatemala

Below: One of the skid-mounted units assembled, ready for shipment



THE NEW 4,000-b/d refinery of Breaux Bridge Oil Refining Co., Inc. expected to be in operation during the first quarter of 1961 near Puerto Matias de Galvez, Guatemala, is unique not only because it is the first refinery in Central America. It also was largely pre-fabricated in Houston, Texas, and then shipped in the form of skid-mounted "packages" to the refinery site.

The first such plant of its kind and size ever built, it may well have marked the start of more process plant construction using this unitized transportable concept. The refinery was designed and built by The Lummus Company's Houston division. Although it is not the first pre-fabricated refinery ever built, it is the largest; Lummus built a somewhat similar unit of 1,000-b/d capacity for the United States Navy about ten years ago.

The reasoning that led to applying this new concept at Puerto Matias de Galvez developed primarily from local conditions. Initial site surveys showed that the Guatemalan labor market did not include any craftsmen skilled in the trades necessary for refinery construction. Furthermore, climatic conditions—such as 190 inches of rain per year—indicated a very discouraging prospect for intensive and efficient construction work. As a matter of fact, the so-called dry season—normally December through March—actually hit the area from March to May last year. These conditions, plus the relatively small size of the processing units, suggested the use of pre-fabrication and shipment from the States to Guatemala.

The payoff, however, and the advantage which could interest many refining companies throughout the world, is in the economies in job costs due to shorter overall completion time. Lummus was able to overlap the schedules for design, procurement, and construction much more than is possible with a normal project. Also, the skid-mounted concept allows quality control during fabrication of the process units due to utilization of skilled craftsmen rather than unskilled indigenous workmen.

Design charge stock at Puerto Matias de Galvez is "reconstituted" crude oil. In this case, it has a light distillate blended with it, and therefore provides a higher percentage of light products than would be the case with natural crude oils.

A typical "grass-roots" project, the plant consists of a 4,000 b/sd crude topping unit, a 2,600 b/sd Unifiner, and a 1,200 b/sd Catformer. In addition, tankage was provided for 100,000 bbl of crude oil and about 70,000 bbl of products.

Skid-mounting was not used for the large processing vessels and for facilities for outside battery limits, such as storage tanks, etc., due to shipping limitations. All the remaining equipment, however—pumps, compressors, exchangers, accumulators, and the like—were set on steel skids and completely piped, wired, and instrumented in the Houston shops. Then they were shipped

to Guatemala and installed on concrete pad foundations.

Total weight of the seven skid-mounted packages came to about 142 tons. The heaviest skid weighed 36 tons; the lightest 12 tons. The skids occupied a total of 8,777 sq ft of space and they ranged in size from 8 x 14 ft to 12 x 22 ft.

Two skids were required for the crude still equipment, and three each for the Unifiner and the Catformer. Equipment assembly on each skid was worked out very carefully in coordination with the overall plot plan. Three-dimensional scale models were used by Lummus' design section in evolving the configuration of mounting such items as pumps, compressors, and the like for the various process units.

The complete refinery, built for between $4 and $5 million, includes—in addition to the process equipment itself—a product blending unit, product loading facility for trucks and tank cars, steam generation and distribution, maintenance and communications facilities, buildings, and eleven houses for key refinery personnel.

The skid-mounting and packaging approach was used wherever practicable on much of the equipment supplied by subcontractors too. For example, the two compressors (for the Unifiner and catalytic reformer) were prepackaged and shipped from the United States, as were also the heaters, the boiler, the electric generation equipment, and some of the pumps for the water system. In addition, the eleven houses—each a three-bedroom modern residence—were all prefabricated in the States and shipped to the site for final assembly.

Rapid installation was the keynote of the entire project. Lummus signed the contract for design, engineering, and construction in October, 1959, and moved into its field office at the Guatemala site in mid-March of 1960. Shop construction and fabrication in Houston began on July 5, 1960. The first skid started its trip to Guatemala on September 7, 1960, and by the end of September, most of the major process units had been erected. The last four skids left the Houston shops October 6, and arrived at the site Oct. 14. The refinery was essentially complete by year's end.

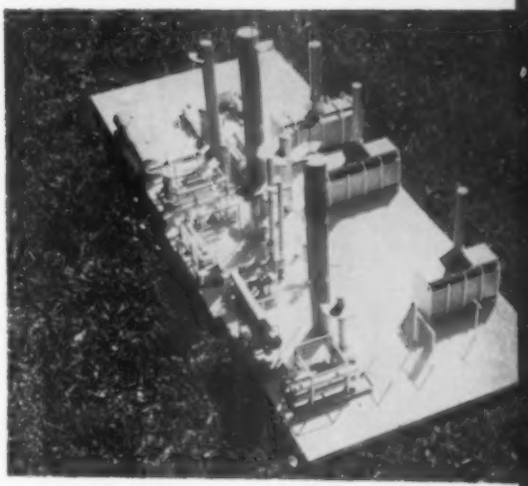
By comparison, a plant of the same capacity and design erected at the same location by conventional methods and under the existing problems would probably have taken about 15% longer to complete and cost in the neighborhood of 10% more in actual job costs. This does not even take into consideration the marketing advantage to Breaux Bridge of being onstream with saleable products at the earliest possible date.

At the same time that the detailed engineering, design, procurement, and construction of process units was taking place in Houston, the Lummus field forces in Guatemala were grading and leveling the site, installing storage tanks, utility generating facilities, personnel housing, and other necessary items.

Refinery site in Guatemala, during the so-called "dry" season

The portable plant technique is not new to Lummus. In addition to the Guatemala refinery and the plant for the US Navy mentioned earlier, the company has built a pilot plant for the Wulff acetylene process, a refinery pilot plant, an emulsion de-oiling unit, an atomic reactor test loop, and a nitrous oxide unit.

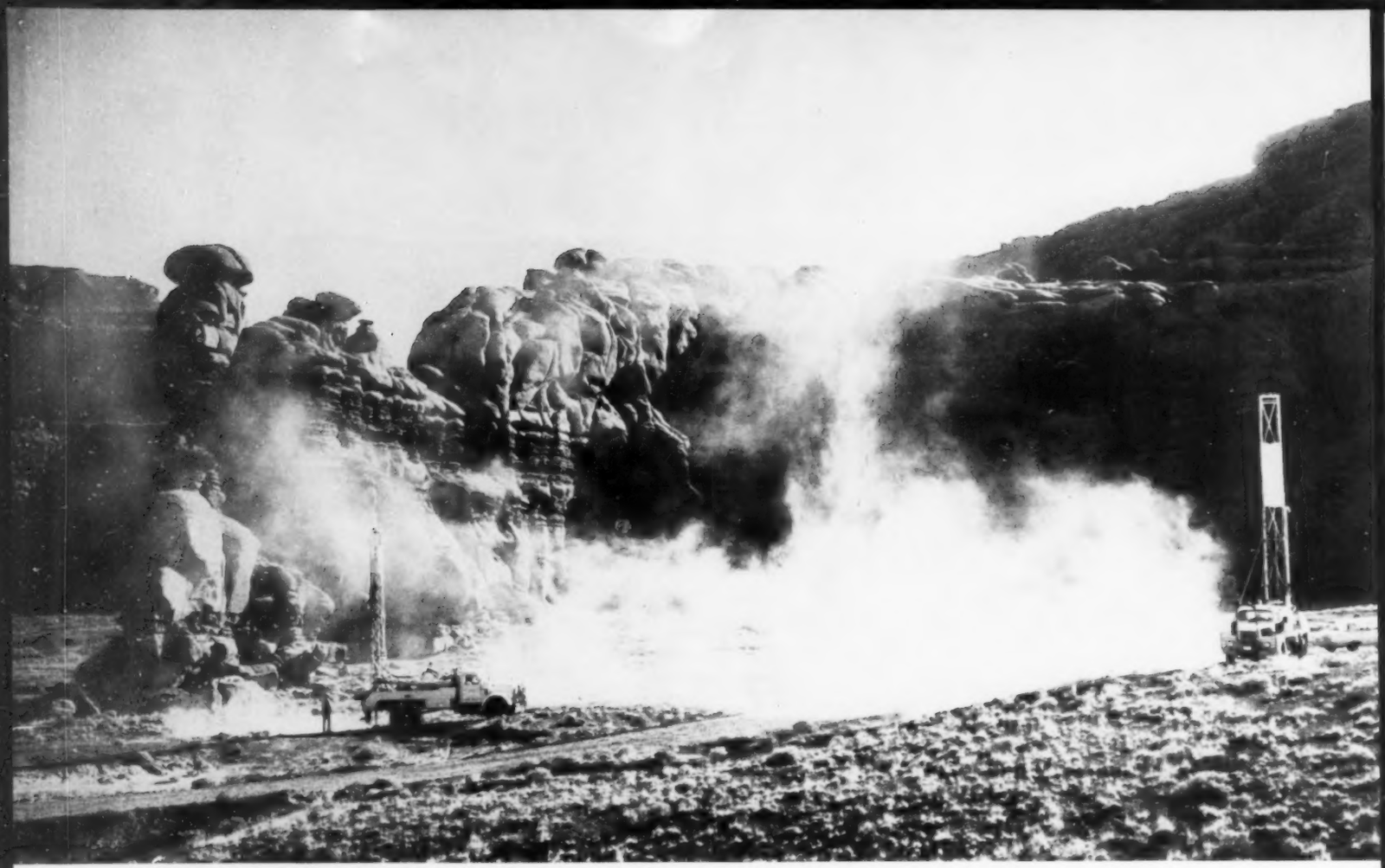
Potential applications for the method would seem to be particularly bright wherever similar construction problems are encountered. Several other companies have indicated an interest in trying it on new plants. END



Right: Model used by Lummus in designing the refinery and developing arrangement for skid-mounted equipment

First units arrive and are installed, along with fractionation towers

Prefabricated housing for personnel was also used at Puerto Matias de Galvez



Air drilling causes the heavy dust clouds in Utah's rugged Orange Cliffs country. Photo is from Horizons, house magazine for Pan American

World exploration review

Oil discoveries were made during 1960 in Libya, Algeria, Venezuela, Colombia and Bolivia. The pace of exploration continued unabated in the early part of 1961, with about 4,489 rotary rigs making hole at the first of 1961

DESPITE EXCESS producing capacity, the world's oil hunt did not slow in 1960 and early 1961. In anticipation of a demand for oil that will use up all known reserves within 20 years, the world's exploratory campaign has continued.

In the Eastern Hemisphere, Africa and the Middle East still are the centers of attraction. Europe had a bad year in 1960, but exploration there is still in its infancy, and substantial reserves may be found in future years. In Germany, eight new oil fields were found in 1960, along with two gas fields. Most of these are related to previous oil or gas-bearing structures, however, and the total for 1960 is less impressive than 1959 when 14 oil finds and seven gas discoveries were made.

In France the area of interest was reduced during 1960. Some extensions to previous oil finds were made, but there were no important new discoveries during 1960.

England gained in interest during 1960 when Esso picked up permits on the south coast based on the possibility that French basins might extend under the channel into England. In the north of England, too, some excitement was aroused by gas discoveries in the the Netherlands, across the water, which companies hoped might be duplicated in England.

Italy had no oil find in 1960. Three exploration wells were drilled in 1960 by Cities Service and Pan American, however, the first by international capital since the 1957 oil law was passed. Spain had no oil finds but is just beginning her full-fledged exploratory effort.

Africa has been the happy hunting ground for oil prospectors. All of North Africa has found oil now, except Tunisia.

Several good finds were made in 1960 in Libya, where Esso and Ohio companies added to their reserves, and more are in the wind. Egypt reported no major discoveries in 1960, but if the Western Desert area is ever finally opened to exploration there may be some excitement.

In Algeria the discovery of oil accumulations in the Lower Devonian and the Cambrian in Tan Emellel and a gas find at Téneré El Beugra and Taouratin were encouraging. Discoveries in the Tinrhert Plateau and the favorable results in the Cambro-Ordovician of the eastern zone stimulated interest in the basin's western half covered by the Erg (Sand Sea) Issaouane and until now little explored.

Interest in Morocco heightened when Pan American International took preliminary permits to look the country over. ENI, the Italian government's company is actively drilling. The Spanish Sahara lost a little of its bloom when Gulf's first wells were dry.

Elsewhere in Africa, Nigeria held the center of the stage. Shell's production in Nigeria is starting to rise appreciably. The rest of Africa has a moderate amount of activity—extending all the way down to South West Africa, where an independent American company took out a large permit area.

Asia and Australasia had no oil finds of major importance. Australia is still trying hard but still not finding. The Philippines had a small oil find but it was waxing badly and hard to produce. India, Pakistan, Burma, and Indonesia had active campaigns underway but no discoveries were reported.

India is negotiating with various of the international oil companies and intends to turn over part of her territory to private oil explorers. Standard Vacuum has finally given up on the areas held under a joint partnership with the government in the Bengal Basin area, but has requested new areas in the vicinity of the Russians' Cambay discovery, this time without government participation.

Pakistan has held extensive talks with the Russians for an exploratory campaign to be undertaken in that country. An agreement is expected shortly, to include operations under a contract similar to that under which the Russians operate in India.

Indonesia is the focal point for the Far East at this time. Literally dozens of companies have made the trek to Indonesia (stopping often in Libya on their way) to discuss with the government committee set up there for concessions negotiations. The recent passage of the petroleum law, awaited for many years has stimulated interest. While the regulations to the law are not yet published, high officials in the government have stated that the model for future contracts will be in the agreement signed with the Japanese group during 1960 (That agreement has been translated and is available from a long-established legislative reference service, Petroleum Legislation. For information on same the publishers should be contacted at Petroleum Legislation Ltd., Post Office Box 1591, Grand Central Station, New York 17, New York.)

In the Western Hemisphere, excluding the United States and Canada, there is little new to report. Alaska has continued its development and gas now appears to be the focus of attention. The Socal/Richfield discovery is being put on a pipeline to the coast and will shortly begin production in earnest. In the latter half of 1960 it was flowing about 500 b/d via trucks.

Union Oil and Ohio Oil have two-mile stepout in the fifth well on their Kenai peninsula acreage. It was completed flowing 5,300 mcf/d of gas through 3/8-in. choke from 5,688-728 ft interval with 1,550 lb tubing pressure. Developed extent of the field is now about 4.5 miles north to south and more than 2 miles east to west. The field is about 65 mi. southwest of Anchorage.

Sinclair Oil & Gas has exercised its option to obtain half-interest in Richfield Oil's exploration activities in Katalla-Yakataga area of Gulf of Alaska, and has assigned half of its 50% interest to BP Exploration (Alaska). Richfield will be the operator. Richfield has two development contracts, covering about 1,060,000 acres, granted in 1959 by Interior Department.

In Canada, what has been defined as the biggest oil discovery in North America since East Texas, the Swan Hills field, has been put on a wide, 340-acre spacing to bring down costs. Exploration has continued but no discoveries of similar size have been found recently. A preliminary count of Canadian well completions for 1960 indicates total of 2,431 wells, down 3½% from 1959 total of 2,516 wells. Alberta had a slight increase to 1,621 from 1,588, but Saskatchewan was far down to 577 from 771 wells. The last quarter of 1960 showed strong Saskatchewan revival with 157 completions against 144 same period of 1959.

In Central America the oil hunt has gone forward but no discoveries of importance have been made. Mexico is working through the government's agency Pemex. Independent contractors for Pemex accounted for two exploratory and 257 productive development wells in 1960. Pemex itself drilled 15 exploratory and 200 development holes in 1960.

During 1960, three new gas fields were discovered in the Reynosa District (North Zone) and three more on the South Zone (Tabasco). In the "Golden Lane" and vicinity, six new oil fields were located, and four in the South Zone (Tabasco).

Limestone producing formations were found in 1960 by Pemex for the first time in Tabasco. The discovery well, Cerro Nanchital No. 1, tested 32 b/d on a 7/32-in. choke. The productive zone was found between 3,333.5 and 3,356.5 feet. This well may prove an entirely new productive structure along the mountain range overlooking the Tabasco plains. The well was

Amoseas exploration camp in Libya. The men named their camps after famous U. S. golf courses (Caltex Photo)

Lights of Karachi gleam in the background as Tidewater's wildcat drills on the outskirts. This Pakistani wildcat was dry (Tidewater photo)

Above: Land mines uncovered in the Libyan desert during Amoseas exploration activities (Caltex photo)

Left: Typical scene in the Rabt Sebeta of the Spanish Sahara. One of Western Geophysical's seismic parties moves across the wasteland where even the guides get lost

terminated in mid-July, and total depth is 3,493 feet.

Elsewhere in Central America and the Caribbean Area there is only sporadic activity. Delhi Taylor will drill a well in Panama during 1961, and Ohio Oil et al will continue its search in Guatemala with another wildcat there, following a string of dry holes with just enough in the way of shows to tantalize.

Cuba's oil industry is beginning a new phase under Russian direction. Four Russian rigs, presumably turbodrills, are in operation now, according to the government's Cuban Petroleum Institute, and a total of 12 are expected to be working by the end of this year.

No operations are going on in any of the other countries of this area, with the exception of Trinidad. There, Pan American, Pure Oil and Sun Oil companies have taken out a large lease on the southeastern and eastern offshore sections, covering some 2,000,000 acres. Dominion Oil, a Socal subsidiary, has about 100,000 acres in the middle of it but its rights will expire if the option to pick up that acreage is not taken up shortly. This area is untested, but the contract covering it is favorable and production obtained is in a politically-stable, accessible area.

In South America a discovery was made in Venezuela's Lake Maracaibo by Sun Oil Co. with the thickest pay yet found in the lake. Brazil had some exploratory news of a negative character, however, as Petrobras geologists almost abandoned hope for production outside of the Reconcavo. The Brazilian campaign of exploration is covered separately in this issue.

In Argentina, the drilling contracts are losing a little of their luster. Well yields are lower than expected, and wells are declining very rapidly, some by as much as 50% in the first year. A recent decree opened the country (in a preliminary way) to exploration and, following choice by YPF of its reserved areas, work will be underway by new companies shortly. Union Oil, one of the few companies having purely exploratory rights, has ceased operations, however, and little exploratory work or drilling is being done by the other companies at this time. Tennessee Argentina seems to have taken a choice bit of oil country in its Tierra del Fuego operations, however. The company was shipping 10,000 b/d out during the Fall of 1960 and intends to increase production substantially soon with completion of a new pipeline.

Ecuador's large tertiary coastal belt, with a thick sedimentary sequence of marine tertiary deposits offers attractive geological prospects, but production has remained restricted to Santa Elena peninsula. Widespread wildcatting in the middle and northern area has so far been unsuccessful. Tennessee, in the region of Mante, where International about 20 years ago, has drilled seven wildcats, all abandoned including two wells in the Daule basin in the region of Balzar. California del Ecuador, subsidiary of Standard California, has now suspended operations and withdrawn from the country. Anglo-Ecuadorian Oilfields, Ltd. largest producer and refiner, completed the remapping of their concession area, but drilled no exploratory wells in 1960. Two semi-exploratory step-outs from the Aneda Field were drilled; one was an oil producer, the other dry.

Colombia had its first Llanos find when Guavio No. 1 was a Texaco dual completion at 10,592 ft 65 miles east of Bogota. Completed in July 1960, the well's upper zone produced initially 216 b/d of 39 API crude—with the lowed yielding 338 b/d of 38 API—on a $^{24}/_{64}$-in. choke. A successful dual completion by Sinclair during 1960 was its Santos No. 1, said to have a potential of 3,000 b/d. On an Intercol farmout, the well went to 9,964 ft, with the pay zone reported to be 350 ft thick. An upper zone tested initially 144 b/d of 32.4 API crude, and a lower zone 845 b/d of 36.1 API oil, on a ¼-in. choke.

In Peru, Peruvian Pacific Petroleum Co., subsidiary of Cities Service and Richfield, on the Peruvian shelf renewed drilling in April 1960, completing 5 additional wells, one also exceeding 6,000 ft depth. The most remarkable venture was connecting well Humboldt 3-3, about 1,000 ft deep, which yielded 200 b/d by a submarine pipeline.

Petrolera Amotape S.A., a subsidiary of Amotape Oil Co., was put into production, on August 26, 1960 well C-20 which flowed 19 barrels per hour through the casing on a ½-in. choke during the first three days, and was then placed on a ¼-in. choke and is flowing approximately 140 b/d. This well was drilled on another section North-West from the "Carpitas" producing field, to a depth of 2,400 feet, but was completed at 1,400 ft, to the "Verdun" formation.

Cerro de Pasco Petroleum Corp., which is a wholly owned subsidiary of Cerro de Pasco Corp., began drilling operations on its concessions in eastern Peru in 1960. The first test is being drilled in the southern part of the Montana sedimentary province of the company's concession Oxapampa #7, in the Palcazu River basin and is about 140 miles south of Pucallpa, the principal town of the southern montana. The first test is on a faulted anticlinal structure, which is visible from the air. The maximum depth projected is 11,000.

Exploration activity in Bolivia in 1960 was about at the same level as the previous year. Highlight was Gulf's Caranda—1 and 2 wells which found some 300-450 resp. b/d of 50° API oil in the lower Gondwana, the first discovery in Central Bolivia and outside the productive belt of Y.P.F.B.'s small fields in the southern subandean zone.

In Camiri field, Y.P.F.B.'s main producer, a deeper Devonian horizon, called "areniscas 16" was found, which is expected to boost the output of the field considerably. Several development and outstep wells in the existing small oil fields were drilled which, however, did not add significantly to the overall production. END

Recent advances in logging techniques

THE SONIC LOG

by C. A. Doh and L. A. Puzin
Schlumberger, Houston, Texas

The June 1959 issue of WORLD PETROLEUM summarized the latest developments in the field of electrical measurements in drill holes. Among newly introduced techniques, a "very recent Sonic Log" was mentioned. During the past two years, the Sonic Log has come to be regarded as one of the best logging devices for obtaining porosity measurements of formations in situ. This article presents a brief, general report on the latest developments in Sonic Logging.

What is Sonic Logging? Sonic Logging is the continuous recording, versus depth, of the time required for a sound wave to traverse a definite thickness of subsurface formation. What is measured, then, is the reciprocal of the speed of sound through the stratified rocks, for the purpose of determining various characteristics of those rocks.

In subsurface formations sound velocities range from about 5,000 ft/sec in clay to about 25,000 ft/sec in impervious dolomite. Correspondingly, the times required for a sound pulse to traverse a thickness of formation, range from about 200 microsecond/ft or more in clays to about 40 microsecond/ft in impervious dolomite.

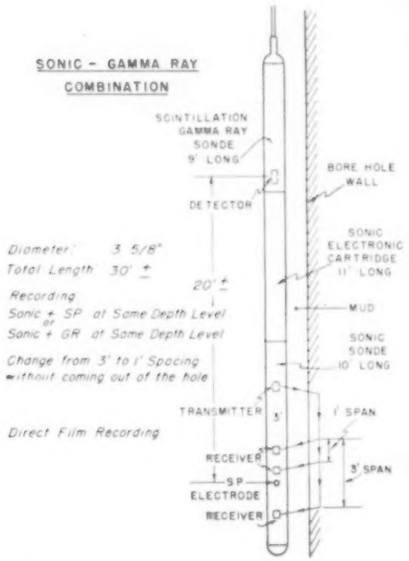


Fig. 1—Schematic drawing of Sonic-Gamma Ray combination sonde.

How the Sonic Measurement is Made. To measure sonic travel time through the formations, modern sonic tools utilize basically a transmitter and two receivers spaced a distance apart in the borehole sonde (as see Fig. 1). From the transmitter are periodically emitted pulses of sound energy. As shown by the arrowed lines, the paths of the first arrivals of the sound energy reaching the receivers are via the formations. The small interval of time between the reception of first arrivals at the closer receiver and at the farther receiver, is measured to give the travel time over the distance between the receivers.

The distance between the two receivers of a basic sonde is called the span. In recording, the travel time is divided by the span to give the formation transit time, *i.e.*, the time required for the sound wave to travel a unit distance. Transit time is measured in microseconds per foot. Fig. 1 shows the arrangement of the standard sonic tool. The three receivers make it possible to record either with a 1-foot span or a 3-foot span. This particular instrument carries an SP electrode and is combined with a Gamma-Ray tool. Other combinations, such as the Sonic-Caliper, are possible, and are in field service.

Sonic logging techniques are applied for geological and lithological information, for geophysical information, and as an aid in well completion.

Geological Applications

A) Correlations. Sonic velocities in most formations of a given lithologic type tend to be distinctively uniform over great distances provided the porosities are about constant. Thus, geologists may correlate by the actual sonic velocity reading of the formations in cases where other logging devices may be unable to distinguish any good markers. Two pairs of correlating logs are shown on Fig. 2; a clear distinction is made between anhydrites and salt, which are often hard to differentiate on other logs.

B) Determination of Porosity. Porosity determination is the most important application of Sonic Logs. In clean, consolidated formations a simple empirical equation relates porosity to transit time, for given tran-

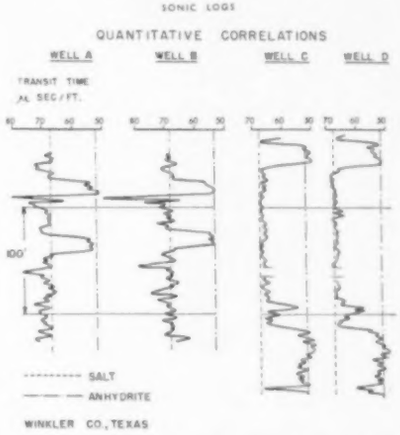
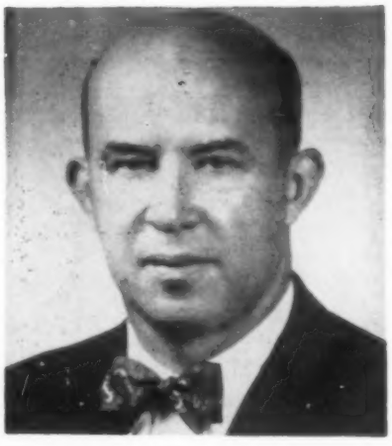


Fig. 2—Quantitative correlations of Sonic Logs in two sets of wells: A and B in one field; C and D in another.



Meet the Authors

Left: Charles A. Doh, formerly manager of customer relations, was named US representative for the foreign subsidiaries of Schlumberger Well Surveying Corp., Houston, in 1957. He devotes his time to consulting with American oil firms active outside the USA. Mr. Doh received an MS from the University of Arts & Crafts in Paris, France, in 1933, and joined Schlumberger in 1934. He has worked in Romania, Trinidad, Venezuela, and the USA, and is a member of the API, AAPG, AIMME, and Nomads, as well as a contributor to technical journals on logging techniques.

Right: Lucien A. Puzin, with Schlumberger since 1928, served as a field engineer in Europe, Africa, and So. America before moving to Houston in 1935. Following service as district and division manager in posts in Texas and Oklahoma, Mr. Puzin was assigned in 1957 to the international branch in Houston. He is active in the AAPG, AIMME, Houston Geological Society, and the Society of Professional Well Log Analysts.

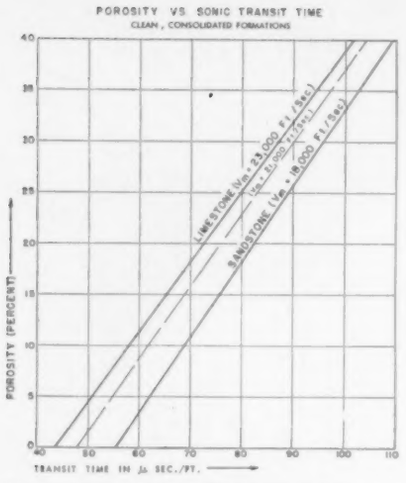

POROSITY VS. SONIC TRANSIT TIME
CLEAN, CONSOLIDATED FORMATIONS
POROSITY (PERCENT)
TRANSIT TIME IN μs SEC./FT.
LIMESTONE (Vm = 23,000 Ft./Sec.)
SANDSTONE (Vm = 18,000 Ft./Sec.)

Fig. 3—Porosity versus Sonic Transit time for various carbonate and sandstone matrices.

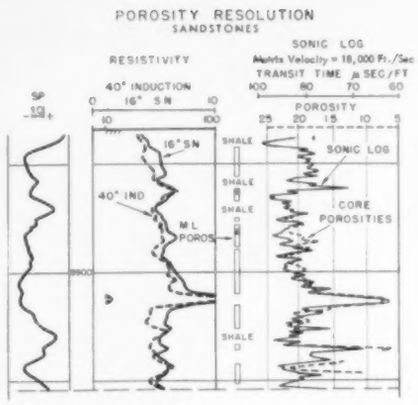


Fig. 4—Comparison of porosities from core analysis and from sonic log in a sandstone reservoir.

sit times in the formation liquid and in the formation matrix material. Other factors such as lack of compaction in less consolidated formations, shaliness, presence of hydrocarbons, etc., can be taken into account by applying further empirical corrections. Fig. 3 shows graphically the relationship between porosity, Sonic Log transit time, and matrix velocity (V_m) in consolidated formations.

Fig. 4 exhibits a comparison between porosity values obtained from the Sonic Log and those from core analysis.

Of the several methods available for porosity determination, from electrical or radiation logs, it seems that Sonic Logging is the most accurate in the majortiy of cases. Other logging methods, however, possess their own, unique advantages: the Microlog can best detect permeable zones and resolve thin beds. The Microlaterolog gives similar excellent results in salt-mud surveys. The Neutron Log is the only porosity tool applicable to cased holes. The new Gamma Gamma Log, which provides density measurements, is particularly good for porosity determinations in shaly sands and is increasingly used in cable-tool wells or in gas-drilled holes.

Thus, although the Sonic Log can be more generally applied, the other methods have their place in logging programs, depending on local conditions. Fig. 5 shows a comparison between the responses of Sonic and Microlog to porous beds.

C) Aid to Saturation Determinations. Concurrently with improvements in instrumentation and field operation, considerable progress has been made in the interpretation of Sonic Logs in conjunction with other logs. Fig. 6 shows how data obtained from Sonic and Induction Logs can be plotted on a special grid to give matrix velocity and porosity. Moreover, zones where hydrocarbon saturations may be present can be seen from the locations of the points plotted in the diagram.

The method illustrated on Fig. 6 is only one of several which have recently been developed. It is accurate and easy to apply. More details on these new interpretation techniques are given in Reference 3.

D) Detection of Fractures, Faults, Etc. Sound absorption or attenuation in fractures, crevices, vuggy zones, shattered-rock fault zones, detrital deposits, etc. may cause a phenomenon on the Sonic Log known as "cycle skipping." This occurs when the sound signal is so attenuated that both receivers are not triggered by the first arrival of sonic energy, but one is triggered by a later arrival.

Cycle skipping is recognized on the Sonic Log by abrupt increases in transit time, seeming to imply unduly low velocities. Although fractured zones may cause cycle skipping, the presence of cycle skipping on a log is not necessarily a positive indication of the presence of fractures. Reservoir or hole conditions other than fractures, faults, etc., can be responsible for cycle skipping. In Fig. 7, the existence of a shattered-rock fault zone, already known from correlation,

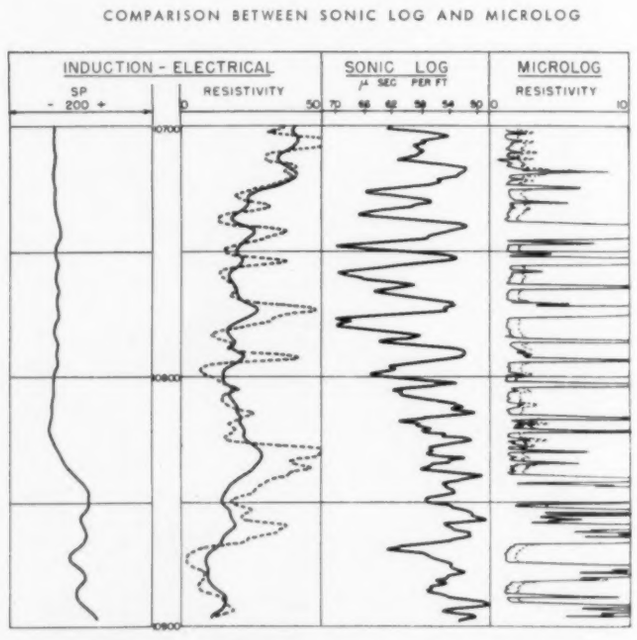


Fig. 5—Above: Comparison of Sonic Log and Microlog response.

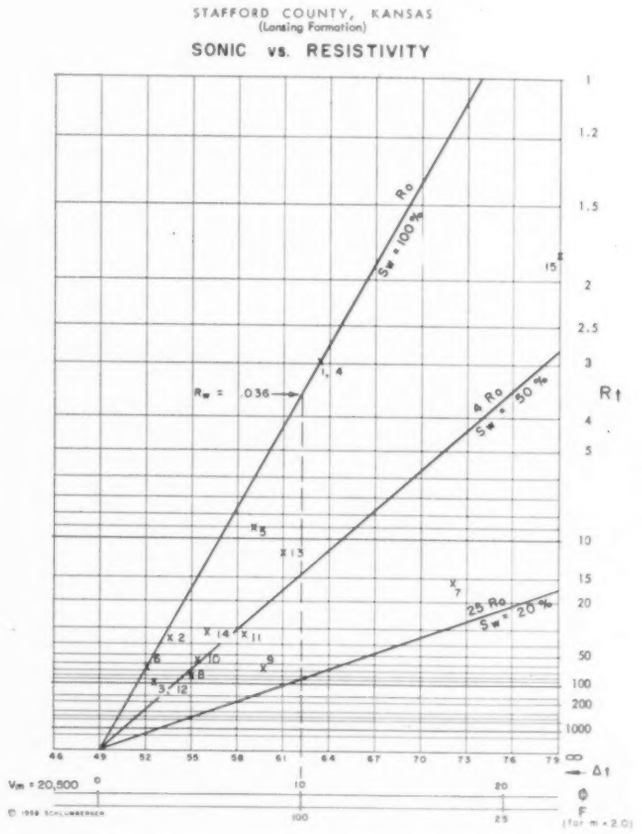


Fig. 6—Right: Interpretation plot of Sonic transit times versus R_t.

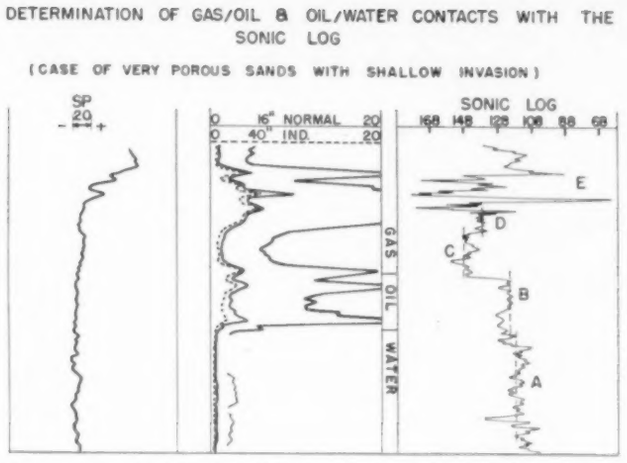


Fig. 8—Above: Gas-Oil and Oil-Water levels shown by Sonic Log in very porous, shallowly invaded sands.

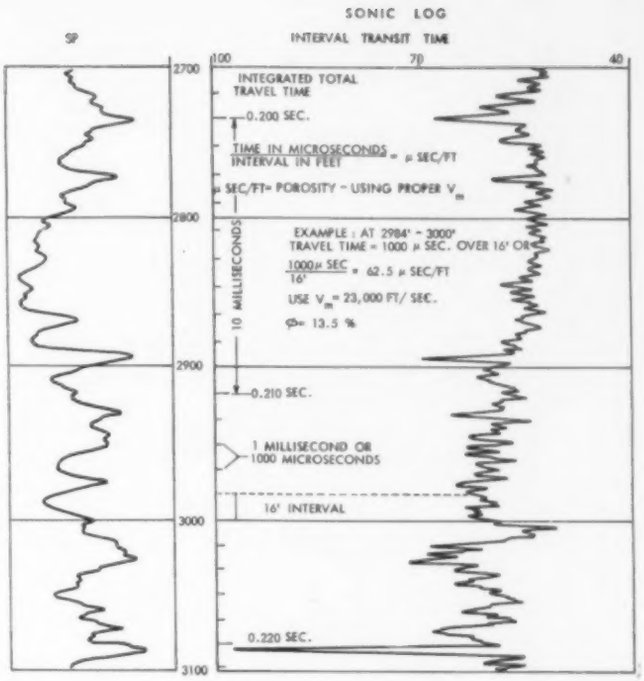

SONIC LOG
SP
INTERVAL TRANSIT TIME
INTEGRATED TOTAL TRAVEL TIME
0.200 SEC.
TIME IN MICROSECONDS / INTERVAL IN FEET = μ SEC/FT
μ SEC/FT = POROSITY - USING PROPER V_m
EXAMPLE : AT 2984' - 3000'
TRAVEL TIME = 1000 μ SEC. OVER 16' OR
1000μ SEC / 16' = 62.5 μ SEC/FT
USE V_m = 23,000 FT/ SEC.
Φ = 13.5 %
10 MILLISECONDS
0.210 SEC.
1 MILLISECOND OR 1000 MICROSECONDS
16' INTERVAL
0.220 SEC.

Fig. 9—Right: Sonic Log with integration "pips" to permit rapid addition of travel times over large sections.

is confirmed by cycle skipping, appearing on the log as a section of abnormally long transit time.

E) Detection of Gas. Cycle skipping may also occur in gas sands. Attenuation of sonic energy may be particularly great in very porous, unconsolidated gas sands which have little or no invasion.

F) Detection of Gas-Oil and Oil-Water Contacts. Due to differences in the velocity of sound through gas, oil and water, it is sometimes possible to locate interfacial contacts, provided the reservoir is of uniform high porosity and invasion is shallow. Fig. 8 exhibits such results.

G) Location of Coal or Lignite Beds. Coal or lignite beds usually have high resistivities, and, on electrical logs, can be confused with limestone or sandstone. The low sonic velocities observed in coal and lignite, however, provide a means for distinguishing them from limestone or sandstone.

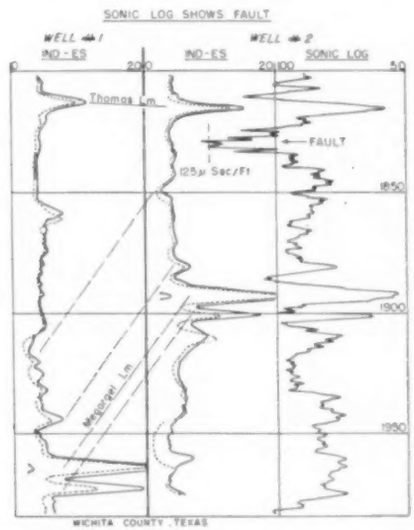


Fig. 7—Location of fault zone by means of Sonic Logs.

Geophysical Applications

A correct interpretation of seismic data often requires the knowledge of the sonic velocity in individual formations or groups of formations; such velocity determinations have been made, in the past, by geophone surveys. Since the Sonic Log gives a measurement of reciprocal velocities, it seems natural to use Sonic Logging data to supplement, and perhaps to replace, geophone measurements.

A Sonic curve can be considered as the sequence of elementary transit times required by a sound signal to travel the entire section surveyed. Consequently, by integration we should theoretically be able to obtain a total travel time similar to that obtained from a geophone measurement. Unfortunately, in the process of integrating the curve, minor errors are also integrated. We must, therefore, either accept a reasonable degree of accuracy or correct the integrated times by means of geophone check shots.

Sonic Log Integrators. Modern Sonic Logs are equipped with integrators which automatically total the travel time increments. Various devices are used; some of them trace a curve of integrated times; others, as shown on Fig. 9, inscribe "pips" on the Sonic Log recording. The travel time between consecutive pips is one millisecond, and the total travel time is obtained by counting pips from top to bottom.

Seismic Reference. Because the present Sonic Log is limited to the uncased portion of the hole, a seismic survey is usually required to complete the record up to the surface or to the datum plane. Tie-in or seismic reference service is normally performed by geophysical companies in cooperation with logging companies.

Check shots are also used to adjust integrated to geophone travel times. Discrepancies between integrated and geophone times seldom exceed ± 5% and are usually much less, particularly in consolidated formations.

Application to Well Completions

The Cement Bond Log. Early experiments with Sonic Logging in cased holes have disclosed that where the casing is not cemented, or where the cement does not stick to the casing, practically all the energy is transmitted through the casing. In such cases the amplitudes of the signals at the receivers are high and the tool measures the velocity of sound in steel (*i.e.*, 17,000 feet per second).

When the casing is cemented, with a good bonding between pipe and cement, the received-signal amplitudes are much smaller, since part of the energy is dissipated in the bonded cement sheath or is transmitted to the formation. The signal amplitudes may be too low for the first arrivals to trigger both receiver circuits, in which case cycle skipping occurs, resulting in longer apparent transit times.

However, cycle skipping on the Sonic Log is not the most practical criterion for cement-bond quality since it is affected by circuit adjustments. It has been found preferable to devise a new technique, the Cement Bond Log, to determine the quality of cementation. In the Cement Bond Log a continuous recording is made of the amplitude of the Sonic signals at the receiver. Minimum amplitude readings are logged where the cement adheres best to the casing.

Fig. 10 is an example of Cement Bond Log. It shows the cement top as well as various degrees of cement adherence to the casing. Cement Bond Logs are also useful as an aid in investigating various completion prob-

(Continued on page 82)

Old gravity should never die

by John L. Bible

Interpretation of old gravity data by current methods can reveal valuable subsurface information

More gravity data has, no doubt, become lost in the files of oil companies than any other type of geophysical information. Since seismic data is interpreted directly in terms of subsurface information, it is usually transferred to geologic maps and maintained in current use. Next to seismic, there is probably more gravity data throughout the world than any other geophysical information. As observed gravity data cannot be directly translated into subsurface geologic structure, it is frequently placed in the file to be forgotten after a brief discussion and possible reading of the transmittal report based upon methods and customs of the times. This data very likely contains a much deeper and more valuable meaning than has been derived or utilized.

Observed gravity over the face of the earth should remain constant over the years except for possible minor changes in the vicinity of earthquakes and volcanoes. Therefore, the actual force of gravity and the observed gravity data remains unchanged regardless of when the observations were made. Since the beginning of petroleum exploration, instruments have changed but their accuracy has been improved very little in comparison with the relief of the anomalies sought. One of the earliest gravity instruments used commercially was the torsion balance. This instrument has not been actively used in the field for several years, but the data obtained had an accuracy equivalent to our present field instruments and even revealed information which is not presently available. Some gravity data was obtained by the use of the pendulum, but the extent of this data was rather limited in comparison with the torsion balance and the gravity meter which later replaced the older instruments mainly as a result of speed rather than accuracy. Some of the early gravity meters had an accuracy in the order of 0.05 milligal as compared with our present accuracy in the order of 0.01 milligal, and many of the older maps were contoured on an interval of 0.5 milligal rather than our present standard of 0.2 milligal. Nevertheless, even the early instrumentation and observed data is of sufficient accuracy for finding most of the gravity anomalies of economic value. Although some of the older work may not have been surveyed in sufficient detail, there are other cases where control was obtained which cannot be surveyed at the present time due to lack of permits or excessive costs.

Meet the Author

John L. Bible has been in gravity and magnetic operations continuously since the days of the torsion balance. After receiving degrees from Indiana University and Louisiana State University, he resigned from a research fellowship at Purdue University in 1936 to enter the gravity department of Stanolind Oil and Gas Co., predecessor of Pan American Petroleum Corp., where he held varied positions in field operations, instrumental research and development, interpretations and finally as supervisor of the gravity and magnetic departments. He resigned from Stanolind to become gravity and magnetic consultant and contractor and now operates his own company—Bible Geophysical Co., Inc., Houston, Texas.

Much of the basic data which has been lost in the files can be improved upon relatively little from the standpoint of accuracy and control, but there has been further development in the proper reduction and interpretation. Latitude, elevation and terrain corrections are applied to the field data in the preparation of the observed gravity map. These corrections must be determined within proper limits before an interpretation will be meaningful. Therefore, the first step in the review of gravity data is to verify these reductions.

The determination of latitude correction has been relatively standard procedure since the accumulation of the earliest gravity data. Although the exact method may not be identical, the end results are usually equivalent.

Accurate terrain corrections must start in the field at the individual station locations; however, the approximate range of the terrain corrections can usually be estimated by a knowledge of the topography of the area. For example, in the Gulf Coast and similar areas of low topographic relief, there will be no terrain corrections except in isolated cases such as road cuts and fills which should be rare if the observer who obtained the original data had been aware of terrain effects. In areas of excessive topographic relief, a large part of the terrain correction can be determined by use of published topographic maps of the area or by the preparation of a topographic map contoured on the elevation values of the gravity stations surveyed. Due to map scale and detail, this will not include possible terrain effects within 175 feet of the station: however, much of this can be eliminated in the interpretational process as will be explained later.

The most important factor in the reduction of observed gravity data, and the factor most likely to be in error, is the elevation correction. Even this factor loses its importance in areas of low topographic relief such as the Gulf Coast; however, in any area where the local terrain varies by more than 50 feet, the elevation correction becomes important. If the elevation factor is incorrect, hills and valleys can become apparent gravity anomalies. This reduction can be checked and the proper correction applied where necessary, if the elevations of the gravity locations are available.

After all reductions are applied properly to the observed data, interpretation is necessary to correlate the gravity with the geology by picking out that part of the gravity effect which represents influence from the zones of economic interest because the observed gravity includes the summation of all density effects from the surface down to the homogeneous core of the earth, much of which is below depths of economic interest. In order to do this a knowledge is required of subsurface densities, at least from the surface to the base of the zones of interest. This density information can be obtained by preparing a density log made by measuring the densities of cores or cuttings at a suitable interval from representative wells in the area. Density logs reveal the magnitude of the density contrasts as well as their depth in order that quantitative estimates of structural relief may be made. A commercial Densilog is now available which reflects the occurrence of possible density contrasts.

When the subsurface density information is known, the gravity influence from specific zones of contrast can be emphasized by preparing residual and differential residual gravity maps. There is a definite correlation between the depth of influence and the

(*Continued on page 66*)

NEW TOOLS FOR THE GEOPHYSICIST

Modern analytical and statistical procedures are being applied to the processing and analysis of field records. Miniaturization is being used increasingly in field instruments. Office equipment is being refined to eliminate resonance and eliminate uncalibrated time differences

MINIATURIZATION of field instruments, intensified development of mechanical energy input equipment and refinements in central office processing of field data have featured developments in the geophysical branch of the industry during the past year. As has been true in recent years geophysicists have worked diligently to improve methods for locating stratigraphic traps. Geochemistry as an aid in regional geological research has continued to gain stature.

In a paper prepared for delivery before the Canadian Society of Exploration Geophysicists at Calgary on Feb. 27, F. A. Van Melle, manager of the geophysical department of Shell Development Co., Houston, gave his views on current trends.

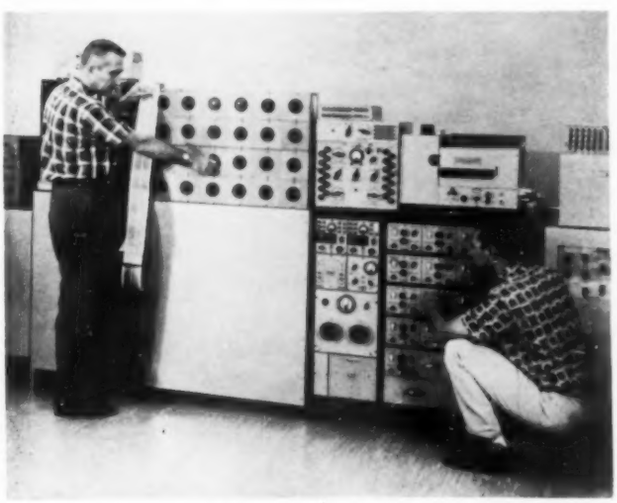
"The trend in current seismic research may be described as one of sophistication, of the application of modern analytical and statistical theories to the seismic field. This can be illustrated by tieing various research developments to a diagram representing the factors which affect the seismogram by their equivalent electrical circuits," he said.

Computers—Application of computers has been extended in a number of directions. Seismic and geological data is being reduced to digital form for high-speed evaluation. At Gulf Oil Corp.'s Harmarville, Pa., laboratories, for example, core samples are analyzed by the X-ray spectograph and the grain shape classifier and the data is punched on IBM cards at the rate of 200 samples per man per day. The computer subsequently can chart as much information in three hours as a skilled laboratory worker could turn out in eighteen months.

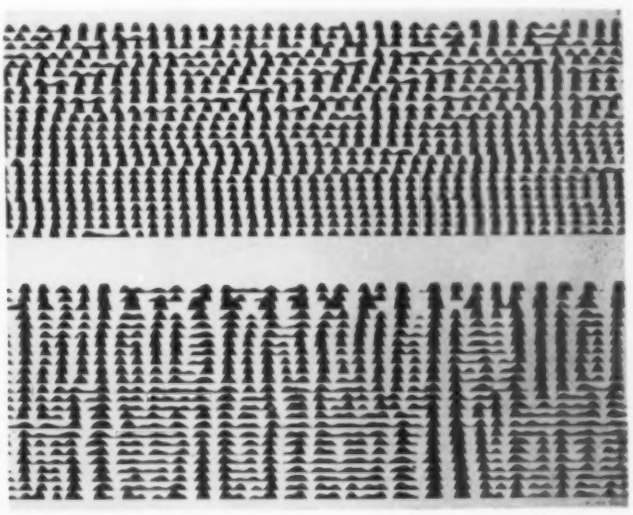
Heart of the Gulf method was to develop a computer language to cover the characteristics of earth samples. The language was based on color, shape and chemical composition rather than on geological names on the theory that oil finders are interested in earth properties rather than in nomenclature. The Gulf computer also can be arranged to transfer its data to chart form for visual studies as an additional time saver.

A digitizer has been developed by Century Geophysical Corp. of Tulsa, that allows analog recorded information, such as well logs or seismograms, to be converted to digital form.

The log or seismogram that is to be digitized is curve followed by the tracing head shown in the accompanying photograph. The log is transported past the curve follower by a variable speed drive. The curve follower is hand-operated to allow overlapping and offscale logs to be processed. Movement of the follower controls a potentiometer that gives a voltage proportional to movement. This voltage is measured by a digital voltmeter and in turn is recorded on paper punch tape. An analog recorder is provided to record the signal input to the digital voltmeter. This recorder gives a check on how well the operator duplicated the original recording.



Preparing the Western Geophysical Co.'s Data Reduction System for trace-by-trace analyses of resonance spectra. Geophysicist at left makes individual trace settings on the Frequential Resonance Rejector, while man at right adjusts amplitude controls



Portion of a resonant marine seismic record before (above) and after (below) processing through the Western Frequential Resonance Rejector. Reverberations within the resonant system created by the water layer have drowned out valid reflection signals in the upper portion of the illustration

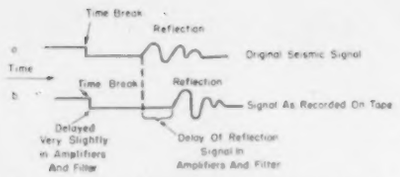


Fig. 1—Normal playback results in separation of the time break and reflected events

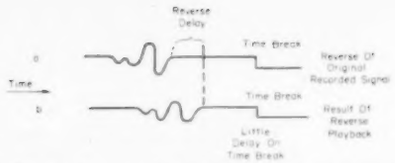


Fig. 2—Reverse playback moves reflected events back into correct position against time break

The command to punch or read is derived from a novel chart movement system. A sector wheel with photocell and light source is connected to the chart drive motor. As the motor turns pulses are generated proportional to chart movement. These pulses are counted by a preset electronic counter so that any number of pulses may be counted to give an output command or punch read command. Thus, by presetting the counter, any desired number of entries may be punched per unit of chart length. An overriding or synchronizing photocell reader that senses the depth or time lines can be used to force readings to be synchronized to depth or time lines. A reference pointer is used to follow the chart grid lines and thus provides a means for retaining curve follower calibration to the grid system of the chart or curve being digitized.

Depending upon the density of measurements and activity of the recorded curve, conversion rates of one to two entries or readings per second are typical. The tape format is binary coded decimal, with a four-digit word length being common.

It has been found that there is a considerable difference in the tape or card input format required for the many different computers and programs being used. Therefore, a selectable word length and fixed entry format control is provided. The paper punch tape can be readily converted to punch cards by standard tape-to-card converters.

Tape Reversal—Reversed playing of magnetic seismograph tapes has been employed as a technique in some central offices to remove uncalibrated time differences.

As a background for this technique it may be said that in electronic circuits, such as seismic amplifiers and filters, events composed of sinusoidal alternating current are delayed. The amount of delay, also known as phase shift, in a seismic amplifier or filter ranges from a very few milliseconds for step function signals such as time breaks, to as much as 40 or 50 milliseconds for narrow band sinusoidal signals such as reflections. This delay, of course, takes place at the time of original recording and there is no easy way of determining how much the delay may be.

This difficulty of determination of delay time is due to the fact that, although we know very accurately from our instrumental design the delay of any particular frequency, the frequency composition of the earth's signals varies unpredictably from location to location. The delay time (or phase shift) varies with the frequency content of the signal. Hence, as the frequency content of a reflection varies from location to location, a change in reflection time unrelated to geologic structure results. The reverse playback technique does not remedy differential phase shift of seismic signals in original recording. In the case of the playback of a magnetic tape through a seismic system, exactly the same type of phase shift occurs as in original recording. In the case of a playback tape, the original sharp, step-function, time break will come through with very little delay. Seismic reflections, which are comparatively narrow band sinusoidal signals, will undergo delays of the magnitude of 10 to perhaps 30 milliseconds. This results as shown in Figure 1, by a separation of the time break and reflected events.

If, however, the original playback is rerecorded on a magnetic tape which is then played backwards so that the time break occurs last in the playback sequence, the sinusoidal reflection events will be delayed and slid backward into their correct position with respect to the time break. (Figure 2).

The question might be asked why original field recordings cannot be played backwards to remove the uncalibrated time differences discussed above. This cannot be effectively done because the complete spectrum of the earth's signals is not recorded on the tape and therefore the compensating delays inherent in the reversed playback are not the same as the original delay.

Century Geophysical's new digitizer, which converts analog recorded data—such as well logs or seismograms—into a digital form

Resonance—The very extensive reconnaissance work in coastal waters has revealed its own set of special problems. One of these is the so-called "singing water" or resonance phenomena.

Resonance phenomena have plagued marine seismic exploration from time to time in various areas. The principal reason this "singing" has been so difficult to remedy is that it refuses to abide by simple acoustical theory. In fact, the industry discovered that theoretically based methods of dealing with the problem failed more often than they succeeded. This led Western to determine that only an empirical trace-by-trace analysis of the resonant frequencies and corresponding treatment offered the degree of flexibility necessary for a commercially practical system.

While removing the fundamental "singing" frequency and its significant harmonics, a resonance rejection system also faces the obstacles of dealing with reasonant energy that happens to fall in the reflection band and of maximizing signal-to-noise ratio although minimizing the "singing." Also, resonance has been found in some instances to be 100 times as strong as the reflection signals. This necessitates at least 100-to-1 suppression of undesired frequencies.

To cope with "singing water" Western Geophysical Co. has developed a "Frequential Resonance Rejector." When records from field tapes show evidences of resonance, they are analyzed trace by trace to determine the fundamental "singing" frequency on each. The tapes are then replayed through a normal filter in series with a set of 40 db (100-to-1), one-cycle-wide, band reject (notch) filters. These playbacks are analyzed for any resonant frequencies that remain and to determine, if possible at this stage, the reflection band. This process is repeated as many times as necessary to establish the best filter combination for each trace. Then the original field tape is played back through the selected combination of filters to make the finished production record. No re-recording ever is needed.

Keystone of the entire system is the comprehensive set of one-cycle-side, 40 db notch filters, which can be used in cascade with one or more other notch, band-pass, high-cut, low-cut, or other filters. All of these filters operate in the frequency domain in order to achieve the necessary precision and extremes of sharpness without sacrificing the economic advantages of production on a commercial scale. END

ARTIST: TOMI UNGERER

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NEW TOOLS FOR THE GEOPHYSICIST

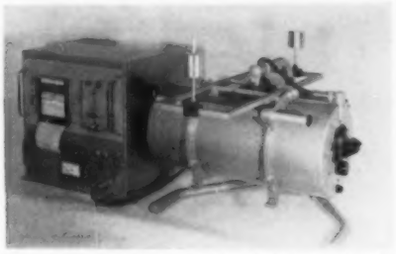


Fig. 1—Seagravimeter with gimbal stand and instrument cabinet

Seagravimeter Gss 2

The Seagravimeter, developed by A. Graf, has been manufactured for some time by the Askania Werke in West Berlin. During the past twelve months valuable improvements were made to this instrument resulting in a considerable broadening of its application.

For a better understanding of the following, the Seagravimeter is shown in Figure 1 with its instrument cabinet. Figure 2 explains the measuring principle of the equipment.

The above mentioned broadening of its application is due to a decisive increase in the damping effect of the built-in magnets with the result that the measuring system responds even under rough sea conditions with small deflections only. This means that the indication elements (optics, differential photocells and amplifier) do not have to meet, to the same extent, the heretofore necessary requirements for extremely high linearization. As a result a measuring accuracy of ± 1 to ± 2 mgal is achieved even with vertical accelerations under rough sea conditions up to ± 100,000 mgal.

A numerical example in the field of length measurements can best demonstrate the operational accuracy attained by the Seagravimeter: With the surface of a large lake roughened by waves with an altitude of 5 meters (peak to peak) the water level of this lake has to be measured accurately to ± 25 — 50 microns. It should be remembered that this measure corresponds approximately to the thickness of a human hair.

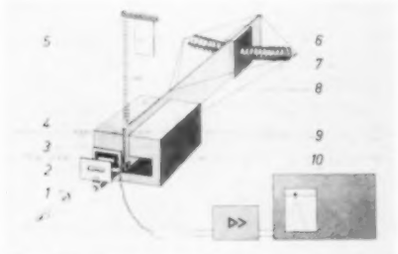


Fig. 2—Measuring principle of the Seagravimeter: (1) photocell lamp and optics, (2) diaphragm, (3) photoelectric cells, (4) damping magnet, (5) measuring spring and scale, (6) torsion spring, (7) fibers for constraining weighbeam motion, (8) weighbeam, (9) amplifier, (10) recorder

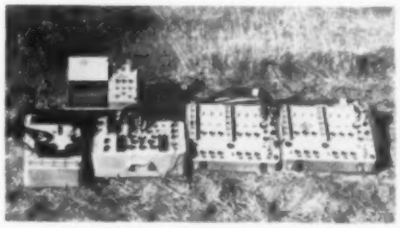
Low Noise Amplifier

Western Geophysical Co., a subsidiary of Litton Industries, has announced that its Transistorized Field Amplifier, developed for portable seismic surveys, is achieving results identical to those obtainable through standard, truck-mounted vacuum tube recording systems.

Every function to be found on the large, truck-mounted unit is standard on the TFA. This means that all necessary automatic volume control combinations and the entire range of Western's plug-in filter combinations may be applied to conditions prevailing in any prospect, no matter how inaccessible it may be to truck or airborne equipment.

A new and original Western development in circuitry, combined with relatively noise-free transistors complying with Western's specifications, has given the TFA an unprecedentedly high signal-to-noise ratio. In field operations this ratio equals that of the Western truck-mounted FA-32 system, which has long been recognized as exceptionally quiet.

While minimizing internal noise, the design is integrated in such a manner that there is no pick-up of extraneous noises



Portable seismic survey system

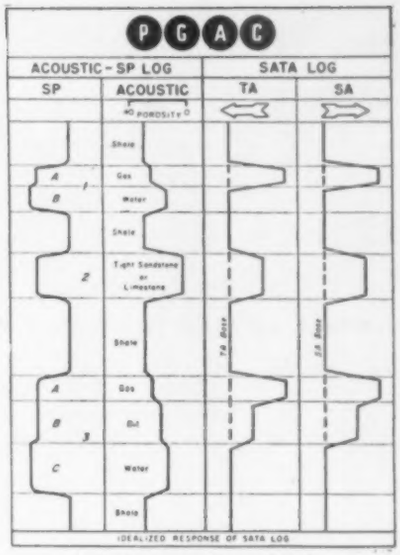
from auxiliary equipment. Relays have been eliminated by Western's first-break circuit. The circuitry of the TFA is also responsible for its temperature-stability from —40 F. to + 140 F.

The TFA is mounted in two weatherproof metal suitcases; each containing 12 channels and satellite-type batteries. Weight of each case complete with batteries is only about 40 pounds. No external power supplies are required—not even transistorized or regulated ones.

Despite its light weight, the TFA has proved to be rugged. During even the longest sustained operational period (10 months), not a day was lost because of trouble in the recording system. No transistors needed to be replaced and no diodes needed to be balanced. However, should a unit require servicing in the field, each twin-channel module may conveniently be removed from the case for ready access to all compartments. All transistors in the TFA and associated equipment in Western's portable recording system are identical and interchangeable. All plug into place.

PGAC's New Sata Log

The new Sata Log, now being run by Pan Geo Atlas Corp., utilizes a unique application of acoustic logging. Instead of log-



Idealized response of new Sata Log

ging the absence of water the Sata logs a physical property of oil itself. Applications of the Sata Log are said to be especially good in fresh water sands and in reservoirs which contain enough shale and salt water to cause low resistivity readings on electrical logs. An idealized response of PGAC's Sata Log is illustrated.

This log exhibits two curves, one of which is the attenuation of the acoustic signal (SA) between two receivers; the other is the transmission amplitude (TA) of the acoustic energy at the first receiver. Distinct acoustic properties of hydrocarbons enable this log to distinguish between gas, oil, and water on a qualitative basis in both high and low porosity media. PGAC makes no quantitative claims at this time for the new Sata Log technique.

"Zone Finder"

Schlumberger Well Surveying Corp. is offering its customers a new easy method of locating possible oil or gas zones recorded on Sonic and Induction Electrical Logs. The new tool, termed the "Zone Finder," is a circular slide rule. It substitutes for charts which may confuse the oil operator who is not versed in detailed log interpretation.

The Zone Finder compares the travel time (Delta T) from the Sonic Log with true resistivity (Rt) from the Induction Electrical Log to point out oil and gas bearing zones and those zones which should be further investigated by sidewall coring or formation testing. The method is based on Schlumberger's apparent water resistivity method and is particularly suited to Gulf Coast formations of Louisiana and Texas.

The Zone Finder slide rule was designed by Reuben A. Smith, field engineer for Schlumberger at Gretna, Louisiana.

A Zone Finder, constructed of durable paper, may be obtained by writing to Schlumberger at 5,000 Gulf Freeway, Houston, Texas. Instructions for use are imprinted on the rule.

NEW TOOLS FOR THE GEOPHYSICIST

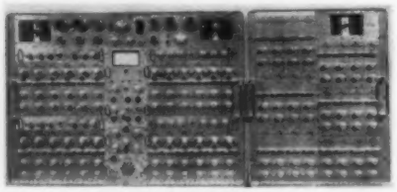
Airborne logging unit

Airborne Logging Unit

Supplying Schlumberger Well Surveying Corporation's logging and completion services to remote and ordinarily inaccessible well locations has been made easier and more economical by the development of a new light-weight air-borne unit. Chief feature of the new design is the division of the complete unit into three principal sections, each weighing 2,000 pounds or less. These components, consisting of recording equipment, winch, and engine drive sections, can be easily and quickly assembled at the well. A special new multiconductor logging cable of small diameter holds down gross weight, but allows running of all types of services to depths as great as 11,000 feet.

Several of the new units have been shipped to the corporation's affiliate, Schlumberger of Canada, Ltd. They may be transported to Canada's northern wilderness locations by helicopter or light airplanes such as the Canadian Otter.

The new units may also find application in offshore workovers where lack of platform space and heavy cranes make the installation of the heavier, standard offshore units impractical.



Transistorized amplifiers

Transistorized Amplifiers

SIE Division of Dresser Industries has announced its PT-100 as a new amplifier with the advantages of solid state design including low power drain, light weight, compact size and new performance standards. Use of light sensitive photocell as AGC element provides signal control and distortion characteristics vastly improved over former vacuum tube designs. This amplifier will not overload in any area. Transistor circuits also eliminate many maintenance problems inherent in former equipment. Low-cut filters in the geophone line help insure negligible distortion. Operator-oriented master controls provide individual record and playback adjustments for both "early" and "final" amplifier gain. Band width and filter adjustments make PT-100 suited for all types of seismic recording-refraction, reflection and high frequency.

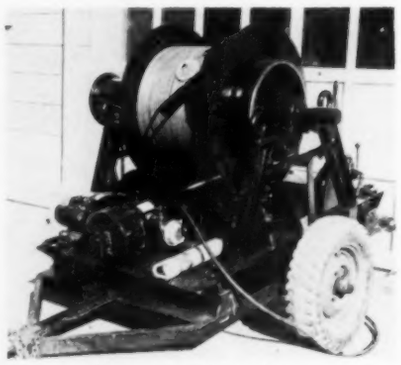
Salt Dome Refraction

A widely used technique in the seismic refraction mapping of salt-dome flanks involves the placing of a geophone at the bottom of a deep well drilled into the salt mass, and the measurement of transit time from shots on the surface of the ground.* Since the wave which is of most interest arrives at the geophone in a nearly horizontal direction, it is essential that the geophone be provided with two horizontal elements in addition to the conventional vertical element. Such a geophone, capable of withstanding pressures up to about 17,000 psi and temperature up to 300-F. has long been available for rental from Keystone Exploration Co., Houston.

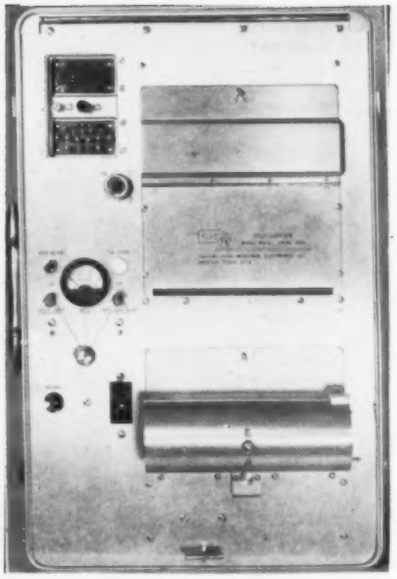
This firm has now provided facilities for installing a second geophone in the well, 500 or 1,000 ft above the first, with both of them operating simultaneously. The difference in arrival time at the two geophones measures the angle at which the wave arrives at the well and hence identifies (in elevation) the point of entry into the salt-dome. The employment of two geophones also reduces the number of shots required.

The two geophones are connected together with an armored Schlumberger cable of required length. In addition, the upper geophone carries a connector which fits the standard Schlumberger cable terminal, so that connection to a Schlumberger cable can be made in the field in a matter of seconds. The geophones and interconnecting cable, weights, etc. are carried on trailer-mounted reel, operated by hydraulic motors, with power furnished by an electric motor suitable for connection to the usual electric power supply on the drilling rig.

*L. W. Gardner, *Geophysics 14*, 1949, p. 29; A. W. Musgrave, et al., *Geophysics 25*, 1960, p. 141.



Trailer-mounted geophone



Triple recording oscillograph

Triple Recording Oscillograph

SIE Division of Dresser Industries has developed its TRO-6 triple recording oscillograph with a view to supplying all needs in a single unit.

Versatility of display and timing allows TRO-6 use in applications ranging from simple, conventional wiggle-trace field recording to the most complex office playback use. Variable-density, conventional wiggle, variable-density and wiggle superimposed on variable-area-and-wiggle superimposed are the possible modes of operation. The same single galvo block is used in all cases. A synchronous drive motor is powered by solid-state power amplifier fed from temperature compensated 400 cps non-position sensitive reference fork. Electronic flasher tube timing is usually employed. Excitation may be from a 100-cps external tape playback signal or from built-in precision transistorized fork-controlled drive circuity. All timing line widths are individually adjustable for ease in record interpretation. A 400 cps timing motor may be easily substituted for flasher tubes if desired.

Seismic Transcorder

Seismic data can be transcribed from paper records onto magnetic tape with the new Transcorder now being produced by Electro-Dynamic Instrument Corp., Houston. The Transcorder will also transcribe recorded data from one size of magnetic tape to another and, with an accessory Transcorder Log Reader, will transcribe well logging data to magnetic tape for use in seismic data reduction equipment. A reproduction of the seismic trace being transcribed can be produced simultaneously for checking purposes.

The Transcorder permits geophysicists to apply modern data-analysis to paper-recorded seismic data without the expense of reshooting a previously explored area. In some cases, this may permit analyses of

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Seismic transcorder

areas that are no longer open to geophysical exploration.

Magnetic tapes produced by the Transcorder can be processed by seismic data reduction systems that permit mixing, selective filtering, correcting for moveout, weathering and elevation, and plotting cross sections by the conventional trace, variable-area, or variable-density methods.

The paper record being transcribed onto tape is mounted on a large revolving drum. The magnetic tape is mounted on another drum that is servo-driven at an infinitely variable rate, which is continuously adjusted to match the magnetic recording with each timing mark on the original record. The magnetic recordings produced are accurate within $\pm 1\frac{1}{2}$ ms of the original record at all times.

The transcorder operator guides the tracking head as the record-carrying drum revolves. The traces are individually transcribed to magnetic tape.

The Transcorder Log Reader, an accessory, permits transcribing well logging data onto magnetic tape in the same manner as conventional seismograms. The resulting tape can be then converted to cross sections by seismic data reduction systems.

Torsion Magnetometer

Geophysical Instrument and Supply Co., Denver, has announced its Torsion Magnetometer model MZ-4, a one-man instrument which does not require any assistant field operator. Hitherto the conventional type magnetometers contained quartz knife edges which were easily dulled or chipped by inattentive operators. The torsion wire design in the MZ-4 does away with the use of quartz knife edges.

The 33° wide angle ball and socket joint on the tripod head eliminates the need for a leg extension when measuring over a steeply sloping terrain, and makes it possible to set the tripod down on moderately sloping ground without worrying abut the position of the legs.

Single-handed measurements may be taken. The observer is therefore able to shield the magnetometer against snow or rain and to illuminate the eyepiece at night.

Unitized Bit Reduces Plugging

The new improved "Blue Demon" unitized insert bit has been developed by Herb J Hawthorne, Inc., Houston, to reduce bit plugging between formation layers, in areas where unitized bits are selected. The new feature consists of deflectors designed into the blade face, which deflect drilled cuttings away from the center of the bit and into the return air or water circulation stream.

Forged into the blades themselves, these deflectors make the bit particularly effective in drilling alternating hard and soft formations, giving the driller considerable versatility with drilling weights, which in turn results in faster hole.

The "Blue Demon" Unitized Insert Bit is designed to be completely worn out and discarded, and is available in $4\frac{1}{4}$-inch, $4\frac{1}{2}$-inch and $4\frac{3}{4}$-inch sizes, with $2\frac{3}{8}$-inch API pin. It is also made as a replaceable insert.

Testing New Logging Tool

A highly flexible self-powered logging tool, the DR-11, recently developed by Electro-Technical Labs, division of Mandrel Industries, Houston, is currently undergoing extensive field tests to determine its extent of applications.

Particularly useful for open hole progress logging of wildcats, the unit can eventually be applied to logging during workovers and in shot holes during seismic operations.

Unique in its design, the DR-11 is a self-powered two trace strip chart recorder packaged in a $2\frac{1}{2}$-in. diameter cylindrical case for operation in a well. The tool is designed to be mechanically and electrically coupled to near standard electric logging probes. The coupled assembly then, consists of a complete logging system, from electrode to visual record, in one package that can be lowered into the hole on an ordinary line.

Each channel of the DR-11 has an input sensitivity of $2\frac{1}{2}$ volts for full scale deflection of the special servo controlled stylus. The record is made on a mylar strip, which measures about five inches wide and is driven by an accurately governed D.C. timing motor.

Correlation between the time base of the recording and depth of the tool in the hole is accomplished by means of a small strip chart recorder at the surface driven at the same constant speed as the strip in the DR-11 with depth marks impressed as a function of the rotation of the wire line sheave.

The recorder has been laboratory tested successfully for temperature limits ranging between 40°F and 350°F and for pressures up to 10,000 psi. Its special mercury batteries have a life expectancy of seven hours at 350°F and up to twelve hours at lower temperatures.

To operate with the DR-11, Electro-Tech is presently developing a combination CVL and self potential probe. Designated the CVP-11, the probe will also be completely self contained, transistorized and battery powered. The SP circuit incorporates an automatic rebasing system so that the recorder can be zeroed at the point in the hole where the log is started.

At any manually set delay up to four hours, a clock automatically turns on the instrument and the recorder calibrates and adjusts itself. It then begins running the log and will continue to operate up to three hours at normal logging speeds.

"While we feel that the most extensive application is progress logging of wildcat wells, we think there are other promising uses," explained a company spokesman.

The unit can be utilized, for example, during remedial or workover work on wells when used with a gamma ray device to log through pipe. Or, it could conceivably be used for logging through drill pipe during the actual drilling operation—that is, down to the top of the bit.

Electro-Tech will manufacture the unit for sale or rent in the very near future, however, it will not offer a logging service. No sale or rental prices or method of distribution has been settled upon as yet.

Vacuum Drill Rig

A one-man, self-propelled, self-contained, hydraulically operated, high vacuum rotary drilling rig has been built by the Houston Tool Co. of Santa Susana, Calif. It operates on a 30 hp, 4-cylinder, air-cooled engine with four speeds forward and one reverse. Hydraulic driving controls are immediately adjacent to the drilling controls with a swing-away seat for the driver-operator that affords excellent driving and drilling vision. The rig has a tongue and hitch and the hydraulic system is made inoperative (neutralized) by a single simple valve for easy highway towing. In addition to 4-wheel hydraulic brakes, there is a hand-operated, mechanical parking brake.

The rig carries all of its own equipment and tools—plus 250 feet of drill pipe. Twin, clear plastic tubes provide a continuous examination of the stratum being drilled and make grab samples easy without interrupting drilling. By use of a plastic bag interliner, inch-by-inch samples may be taken and retained for analysis, shipment and storage.

In addition to vacuum drilling (which requires no water in dry formations, takes a 100% continuous sample, and cannot lose circulation even in broken and fissured formations) the Model H.D. 250-S drills with forced air; with forced water; with reverse water; vacuum with water; drive core sampling; augering; diamond core drilling with vacuum, with forced water; bucket drilling; and can also drive casing while drilling. It drills at any angle and in all formations.

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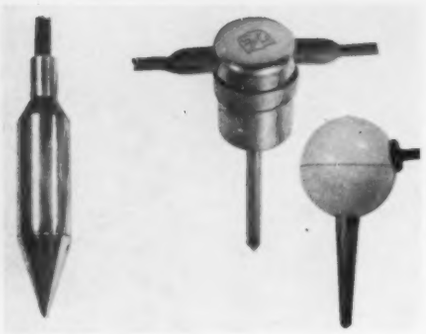
NEW TOOLS FOR THE GEOPHYSICIST



Sub-Miniature Geophone

Hall-Sears, Inc. has completed a new sub-miniature geophone, the HS-J, weighing only two ounces and measuring $^{15}/_{16}$ in. high by $^{7}/_{8}$ in. diameter, the HS-J reduces planting and retrieving problems. Small reels for handling both geophones and cables are proving to be satisfactory.

In spite of its small size, the usable output of the HS-J equals that of standard geophones. A 2-spring suspension, one at each end of the balanced inertia element, is used, providing negligible horizontal sensitivity and undistorted output at large angles of tilt. It is free from spurious resonances.

The extremely small size of the HS-J permits the entire unit to be enclosed in a plastic sphere 1½ in. in diameter if desirable to do so. Many users consider the spherical shape easier to handle and the electrical insulation from ground of the complete unit reduced extraneous pickup. Pictured with the standard unit and plastic enclosed unit is the HS-J in a marsh case.

Pressure Sensitive Geophone

Engineering and development of the MP-2 geophone has been recently completed by Hall-Sears, Inc. The unit is sensitive to pressure changes and is intended for use in water covered areas. It was developed to fill the need for a high output geophone suitable for use as one or two per trace. While the basic construction is patterned after the MP-1, introduced by Hall-Sears in 1959, the power output available from the MP-2 is approximately 100 times that of the MP-1. It operates on a variable reluctance principle with a dual diaphragm and dual armature arrangement, one on each end of the unit. The magnet is surrounded by a coil form and coil. Two rubber springs are provided on each end of the magnet to provide the air gap and separate the moving armature from the magnet and the iron sleeve that surrounds the magnet and coil.

The entire unit is capsulated in rubber with perforated rubber diaphragm guards on each end. As the pressure is increased, the moving armatures move closer to the magnet and iron sleeve, thus reducing the gap and increasing the flux lines linking the coil. The flux is reduced as the pressure is reduced. Changes in flux linkages generate an electromotive force across the coil. This voltage generated is proportional to the rate of change of flux.

No effort was made to equalize pressures in the MP-2 since as the static pressure is increased, the moving armature moves closer to the magnet and shortens the gap. Thus, for a given displacement of the diaphragm, a greater change in flux results when operating at increased static pressures.

However, the spring constant also increases or becomes stiffer and for a given pressure change, results in a smaller displacement of the moving armature. The net result of this interaction is to reduce sensitivity as the static pressure is increased. However, the reduction in sensitivity due to increased static pressure is not as pronounced as in other similar units.

Response of the MP-2 to motion can generally be neglected due to the fact that dual diaphragms are used, one on each end of the unit.

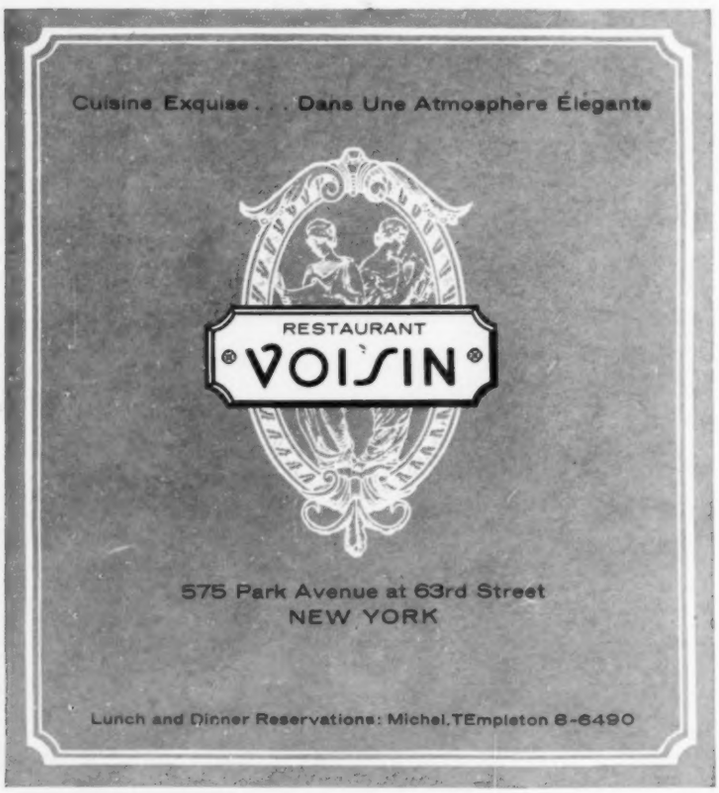
The rubber diaphragms and rubber springs serve as effective damping agents and eliminate undesirable resonant peaks. There is no alteration in the phase relationship between output and excitation over the range of 10 to 100 cps. Standard coil impedances of 230, 1,800, and 3,000 ohms are available.

The two diaphragms provide excellent coupling between pressure variations in the water and the detector. Orientation problems are completely eliminated since it is necessary to simply immerse the detector in water, irrespective of its position. When used in shallow water for conventional seismic prospecting, the detectors may be attached directly to the spread cable and laid out on the water bottom.

Deep Well Geophone

At the recent New York conference of the Instrument Society of America, Dr. C. M. Wolfe, engineering specialist for United Electro-Dynamics, Inc., Pasadena, Calif., described a deep well pressure geophone with sensitivity sufficient to measure the pressure of seismic waves having an amplitude of one Angstrom at one cps. Frequency response extends from dc to 40 cps and the structural design is such as to withstand the static pressure at 10,000 ft. The instrument was developed under a U. S. Air Force contract. Sensitive element in the geophone is a thin plated Mylar diaphragm contained in a 3⅜-in. O.D. tubing and the housing of electronic assemblies must sustain 10,000 psi external pressure.

At the same meeting Walter A. Bohan of Cook Research Laboratories, Chicago described an instrument for the measurement of the underwater speed of sound. The unit is designed to operate at a maximum depth of 1,200 ft and to obtain sound measurements with a high degree of accuracy. This instrument was developed for operational use of the Navy.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French seismograph developments

Transistorized refraction system, magnetic tape recorder and millisecond delay line are new products of Cie. Generale de Geophysique

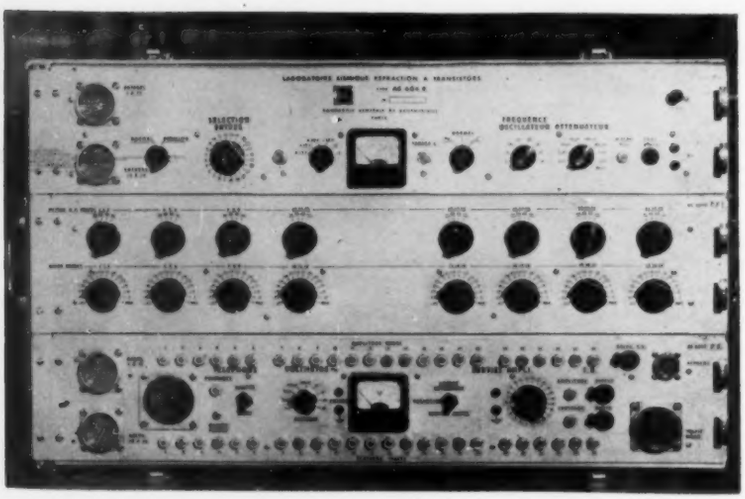
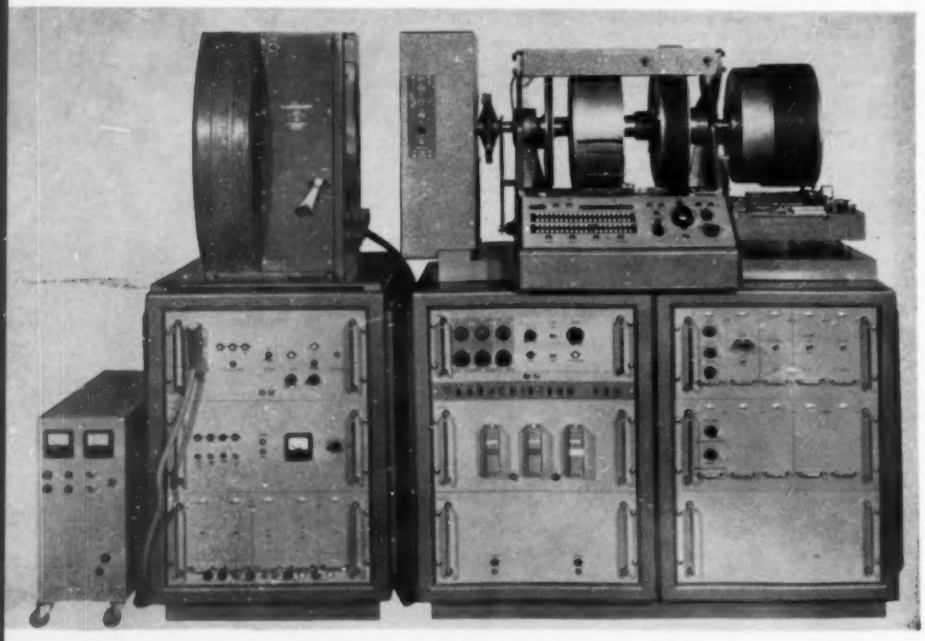


Fig. 1—The AS 604 R transistorized refraction seismograph system

Fig. 2—The Transcripteur; a system for transcribing magnetically recorded seismograph records to any magnetic tape configuration



THREE NEW AND UNIQUE seismograph developments in equipment have been made available by the Compagnie Générale de Géophysique recently; (1) the entirely transistorized refraction seismograph recording system AS 604 R, (2) a magnetic tape transcribing system, the "Transcripteur," and (3) a millisecond delay line. All three products were engineered and designed by the Laboratoires d'Electronique et de Recherches Géophysiques division of the company, located at 96, avenue Verdier, Montrouge, Seine, France (a suburb of Paris).

The AS 604 R system, Figure I, is contained in two fiber-glass suitcases, one containing the entire electronics weighing 77 pounds, and the second the power supply including battery weighing 33 pounds. The system can be supplied with a recording oscillographic camera and a magnetic recording system. The electronics unit contains the amplifiers, filters and auxiliary circuits in a 30-in. by 17¾-in. by 8-in. suitcase.

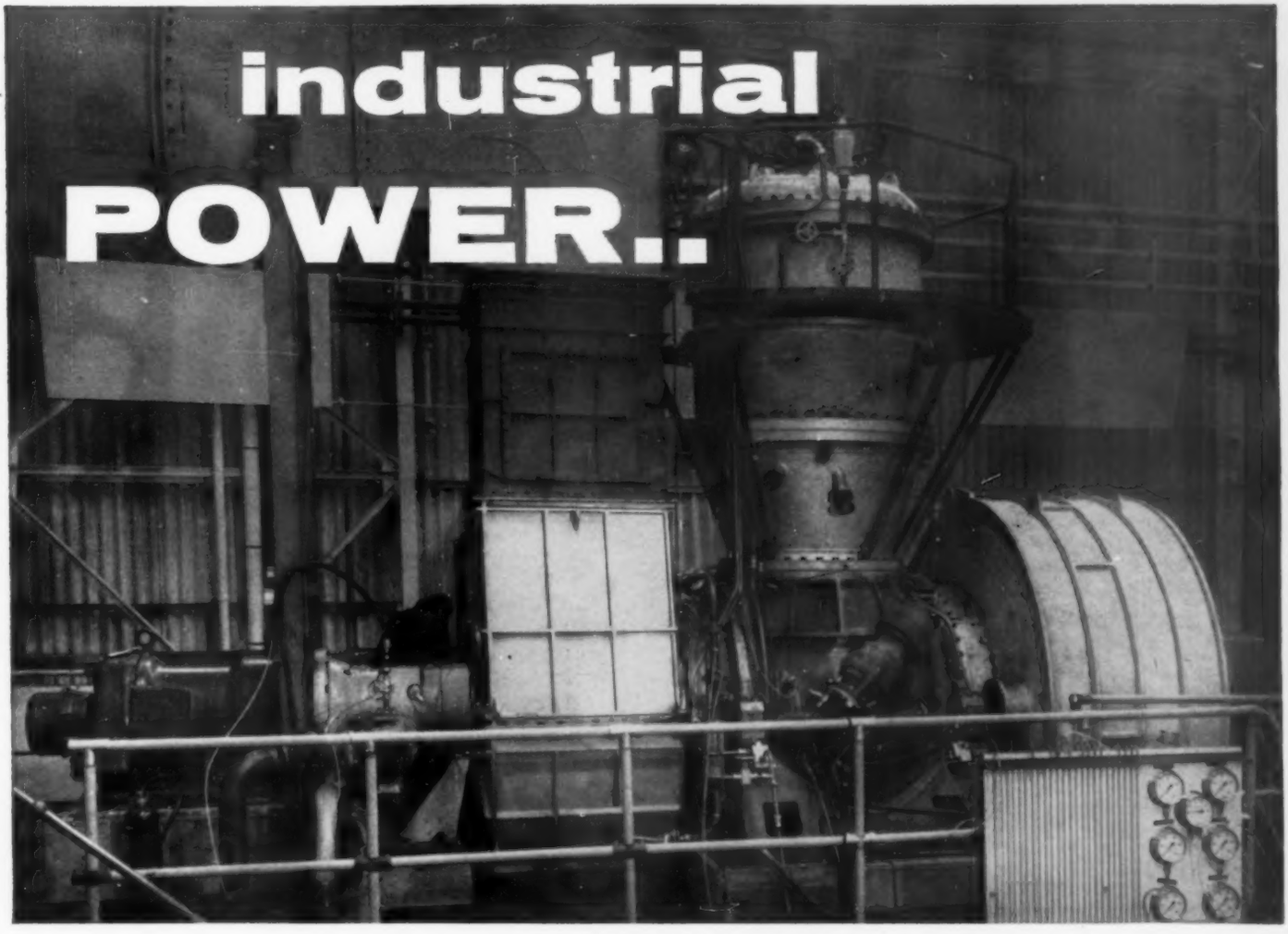
Three hinged units provide easy access to allow servicing and maintenance of the equipment. The first unit holds the 24 printed circuit per-amplifier boards of a plug-in type that are completely interchangeable; this unit contains also the test circuits that include an oscillator, voltmeter (power supply), and provisions for continuity-leakage dèterminations. The second unit contains the high cut filters banked three to each control with cut-off frequencies at 20, 28, 40 and 56 cps and a rejection rate of 24 db per octave. This unit also has amplifier gain controls. The third unit holds the output amplifiers, 24 printed circuit boards of a plug-in type that are interchangeable, the transistorized output voltmeter, telephone unit, time breaker amplifier, time break radio, 24 output sensitivity potentiometers and 24 DC galvanometer positioning potentiometers.

The power supply unit, including the self-contained battery, is also in a fiberglass suitcase 15 in. by 12½ in. by 7¾ in. It includes battery voltage measuring unit and incorporated battery recharger from an external 12-volt source. Power consumption is 1.9 amperes from a 12-volt source, external or internal. The internal battery will function for an entire day of uninterrupted recording and observation, so that the observer can, continually, be prepared to operate during the period of least ground noise.

The "Transcripteur," Figure 2, fills a void in instrumentation that has only been partially answered by the instrument manufacturers of geophysical equipment. The "Transcripteur" provides re-record possibilities for nearly all types of magnetic field recording systems. Traces are transcribed sequentially in groups of four channels for the "Magnedisc" system and in single trace sequential steps for all S.I.E. systems (MR-4, PMR-6, PMR-7, PMR-20, MS-15), Techno systems, Electro-Tech DS-7 systems to a standard tape configuration such as

(Continued on page 63)

COMPACT industrial POWER..



An 'ENGLISH ELECTRIC' EM85 gas turbine undergoing works test. This is one of seven units being supplied to the Iraq and Basrah Petroleum Companies for pump drives.

'ENGLISH ELECTRIC'

industrial gas turbines

The 8,000/9,000 h.p. 'ENGLISH ELECTRIC' EM85 gas turbine—only 21 ft. long—is, for this power, one of the most compact two-shaft industrial units available. This multi-purpose turbine, operating efficiently over a wide range of output speeds, has an attractive fuel consumption and embodies experience gained with earlier designs ranging from 3,000 h.p. to 28,000 h.p. The exceptionally small size of the EM85 and the absence of reciprocating parts keep building and foundation costs low.

For technical details, send for Publication GT.104: The ENGLISH ELECTRIC Company Limited, Gas Turbine Division, Whetstone, Leicestershire.

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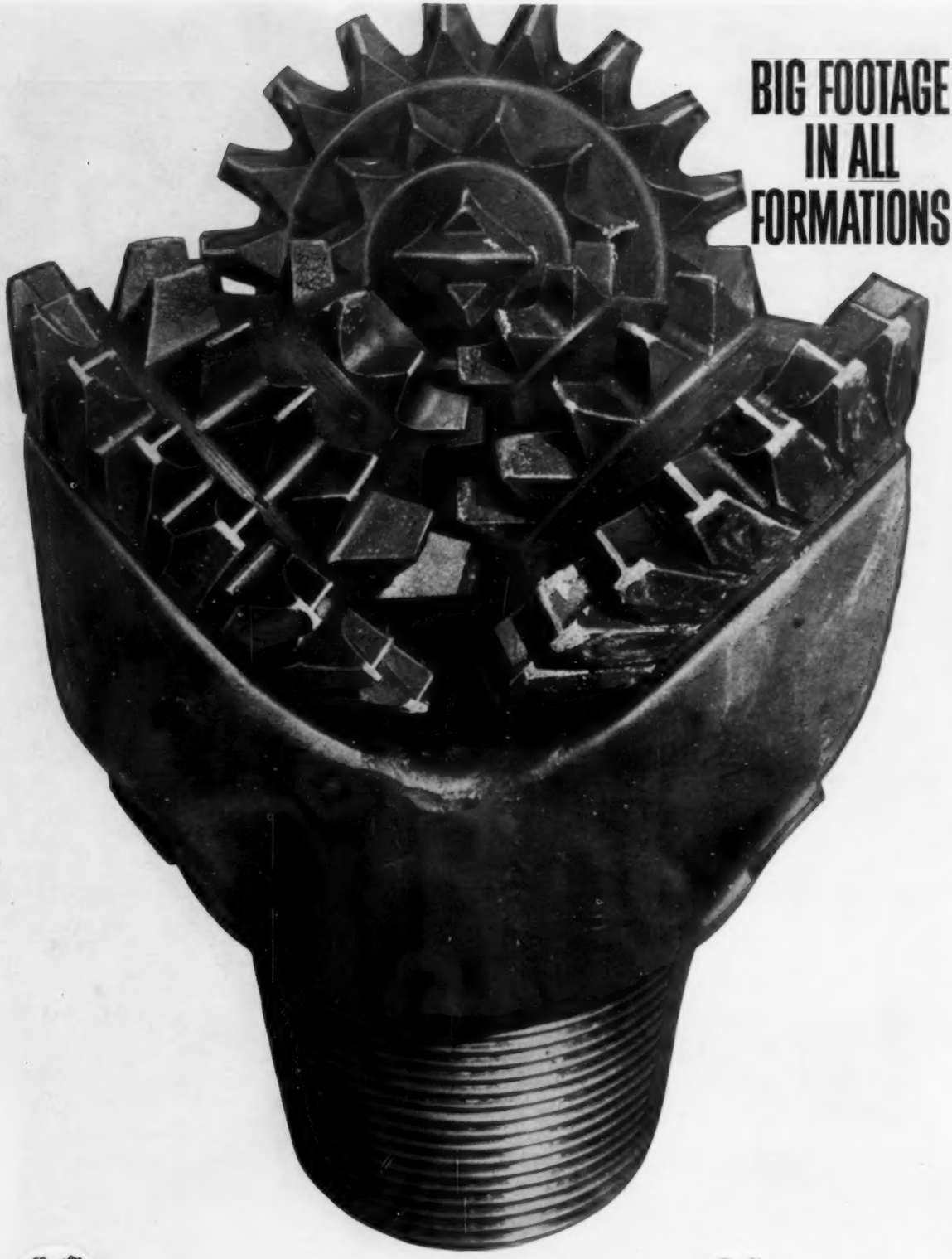

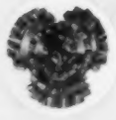

TYPE ES—salt, red beds, gypsum, anhydrite, unconsolidated shales, medium-hard limestones.

TYPE EM—hard shales, sandy shales, hard limestones, anhydrite.

TYPE EH—chert, quartzite, granite, flint, novaculite, pyrite bearing quartzite, basalt.

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French Seismograph Developments

(Continued from page 60)

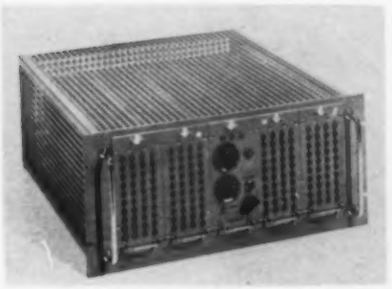


Fig. 3—The Delay Line; a transistorized resistance-capacitance delay line for millisecond time delays

the Carter FR-1. Programming is rapid and simple by means of the three program plugs. The "Transcripteur" is the only equipment available to the petroleum industry that can: (1) transfer "Magnedisc" recordings, (2) use "noise cancelling" or "pilot channel" corrections during the transcribing process, (3) permit time break alignment or standardization during transcribing, (4) show the modulation level (percentage) on an incorporated cathode ray oscilloscope and allow adjustment of level during the re-record process, (5) reprogram channels on the tape as wished, and (6) give immediately a fully monitored dry-processed paper record of the re-record tape of examination at the end of the transcription cycle.

Rounding out the L.E.R.G. contributions to Compagnie Générale de Géophysique and its clients is a transistorized delay line for time corrections, filtering, removal of singing in marine areas, and high-line (50 or 60 cps pickup) on land. Eliminated are heavy, bulky and expensive toroidal inductances of conventional delay lines and the mechanical complexities of the magnetic drum memory delay line. The input signal capacity, pass band, is very conservatively rated at 10 to 100 cps. Figure 3 shows a standard assembly of four chassis, with switch unit; this is a standard 19-inch rack unit with a total of 160 milliseconds of delay incorporated. The four chassis can be cascaded for a 160 ms delay, or used in parallel as four units of 40 ms each. The delay line is tapped at 1 millisecond intervals with the outputs of each tap available on the front panels of the chassis as well as on the rear plug of each.

With its light weight, low cost and power requirement of only 200 milliamperes from a 12-volt source, the delay line is considered by its manufacturer a major instrument development, available for operations on the demodulated seismic events, either in a central playback facility or in the field.

In addition to the new products presented within the past few months, Compagnie Générale de Géophysique has developed and is manufacturing through Société de Matériel Electronique et Géophysique: (1) a generator-type blaster, SBT-1000, (2) a time break repeater for magnetic recording of refraction seismograph operations where radio transmission of the time break is required, the S-TR-EM 2, (3) a magnetic tape eraser, the SEF-110-220, (4) radio beacons for small aircraft homing in remote areas lacking visible landmarks, type BL-2-A and type BL-50-A, and (5) Cable fault finders, type DC-24 for geophysical applications and type DC-2 for routine applications.

The SBT-1000 generator type blaster is a generator-capacitor blaster rated at 1000 volts, a bank of capacitors totalling 25 micro-farads is charged from a governor controlled generator. The firing circuit may be completed manually or by remote control from a magnetic recorder or the time break repeater unit S-TR-EM 2. The blaster includes time break circuits, sound power telephone unit and a detonator tester for electric caps.

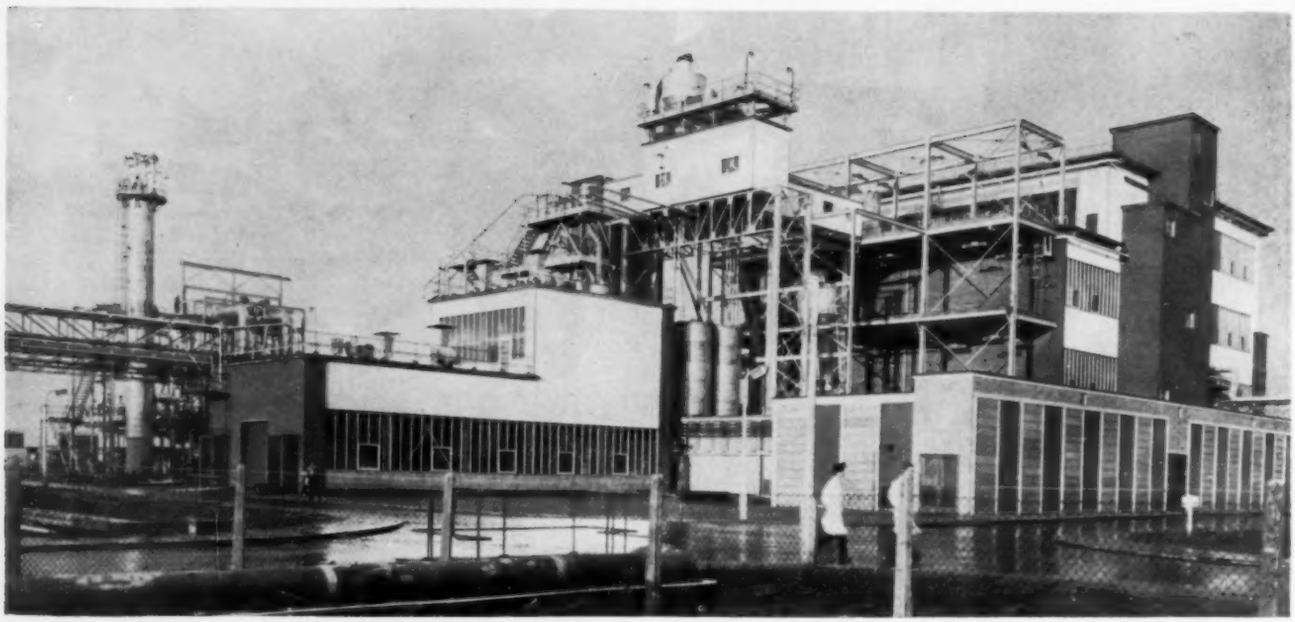
The time break repeater unit, S-TR-EM 2, is a fork controlled counting circuit for use in refraction seismograph operations with magnetic recording. The 1024 cps fork output is successively divided by 12 binary counters to obtain a ½ cycle per second signal; initiated by the time break, the count is begun and controls the 5000 cps modulation of a radio frequency.

The magnetic tape eraser, SEF-110-220, is a specially designed eraser for operations on either 110 or 220 volt, 50 cps power supplies. Tapes are erased by being passed through the core of the inductance.

The radio beacons, BL-2-A and BL-50-A, are homing devices for any vehicle or airplane equipped with a radio direction finder. They are portable crystal controlled oscillators transmitting in the range of 1.6 to 1.8 mcps. Transmission times are controlled by a clock mechanism that may be programmed to fit the needs of the purchaser. The BL-2-A is rated at 2 watts output and has a range of six miles; the BL-50-A is rated at 50 watts and has a range of 40 miles. The power supply is obtained from self contained batteries. The beacons are intended for the recovery of temporary points in areas of monotonous landscape where considerable time might be lost searching for a surveyed marker.

The cable fault finders DC-24 and DC-2 are devices for determining breaks in cables either 12 pairs or two pairs. A 1700 cps signal is applied between a ground and the conductors of the cable. A portable detector is used to search the length of the cable in order to determine the location of the fault.

END



Imperial Chemical Industries' new 11,000 ton/yr "Propathene" plant at Wilton, England

Wilton polypropylene plant now operating for ICI

THE FIRST UNITED KINGDOM plant for the bulk manufacture of polypropylene, Imperial Chemical Industries' 11,000 ton/yr "Propathene" plant at its Wilton Works in Yorkshire, started commercial production at the beginning of December last year. And the company is sufficiently confident of the product's future to be already making plans for rapidly doubling this capacity, and later trebling or quadrupling this.

Although a pilot plant was built in 1957-58, construction of the main plant could not start until a license was obtained under Montecatini/Ziegler UK patents covering polypropylene production and use. Thus work did not start on the site until May 1959.

That the completion date set of September 1960, seemingly at that time an almost impossible target, was achieved reflects the greatest credit on the main contractors—Constructors John Brown Ltd. This firm also designed some of the self-contained units into which the plant was divided, and ICI engineers designed the others.

The first section of the plant was handed over for start-up April 1960. Thus when the final section was handed over mid-September a large part of the plant had already had trial runs. Some important market applications had also by then been established, and manufacturers of plastic goods are now tooling up for many other applications involving large tonnages. Thus the plant will be occupied at a profitable level much sooner than if the new plastic "Propathene" was only now being introduced to customers for the first time.

ICI is now producing polypropylene ("Propathene") and polythene ("Alkathene"), the latter with a capacity of over 100,000 ton/yr, both based on the three giant oil crackers at Wilton. Under a more recent agreement between ICI and Montecatini, ICI is now actively preparing for the exclusive UK production of polypropylene filament yarns, textile monofilaments and staple fibers.

"I want to stress that we consider that 'Propathene' is a new plastic of *major* significance," said E. G. Williams, joint managing director of ICI's plastic division. "It is not just another polymer; it is a new material which we think is destined to play a substantial part in our everyday life in the future.

"Why are we so confident of this? For two reasons. First, 'Propathene' will not be a high-priced product but will readily find its level among the other well-established cheaper thermoplastics. Secondly, as could be predicted from its regular isotactic structure, it has a remarkable balance of properties, properties which, while in many ways similar, are largely complementary to those of polythene. . . Later on we expect 'Propathene' film and fibers to take on equal importance and we can already visualize a big future for the film in the packaging industry."

An exhibition of the first prototype articles made from "Propathene" clearly demonstrated its very low density, high strength, and its temperature resistance. It was notable for the very wide variety of articles and designs shown, ranging from washing machines and suitcases to women's shoe heels, and from extruded piping for domestic plumbing to fibers and filaments for ropes, carpets and knitted fabrics. Many of these are expected to be on general sale early in 1961. END

Interior view of control room at the ICI polypropylene plant

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Pyrene TRADE MARK

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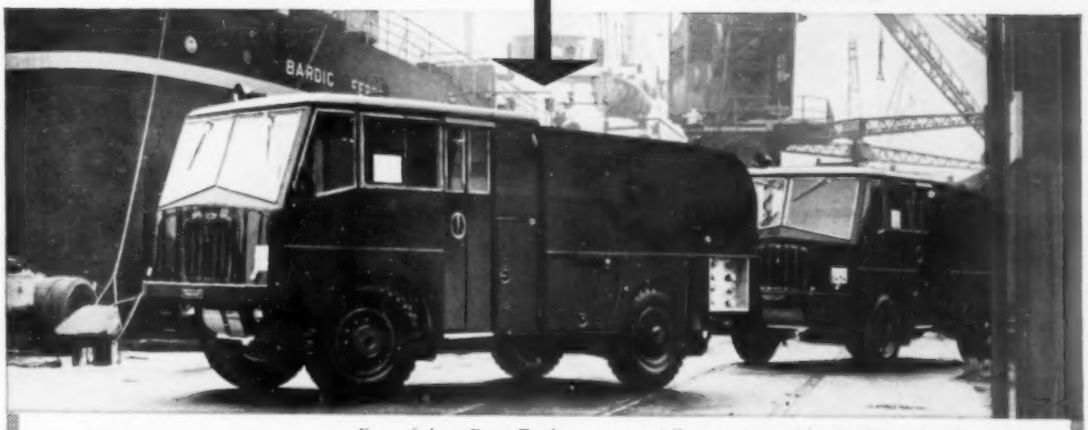

EN ROUTE TO HUNGARY *Four of these Foam Tenders were specially commissioned by the Hungarian Fire Services for use on airfields and oil refineries. The illustration shows them being driven on to the cross-channel "S.S. BARDIC FERRY".*

PYRENE

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Cities Service Name Change

Corporate name of Cities Service Oil Co. (Del.), Bartlesville, Okla., has been changed to Cities Service Petroleum Co. Robert L. Kidd is chairman and J. E. Heston is president. The company will supervise exploration, producing, refining and pipeline activities in the United States and Canada.

USA Fuel Supply Ample

The USA has ample supplies of conventional fuels to meet rising energy requirements over the next 15 years without turning to atomic power, according to a recent survey by Resources for the Future entitled *"Energy in the American Economy, 1850-1975."* The study predicts that between 1955 and 1975 energy consumption in the USA will have grown by 88%, or at an average annual rate of 3.2%. In 1975, oil is expected to account for two-fifths of total energy consumption; coal and natural gas, each for one-quarter, and natural-gas liquids and hydropower, for the remainder of the less than 10%.

Sulzer Engines Extended

Sulzer Brothers Ltd. have extended the power range of their turbocharged two-stroke marine diesel engines of the RD type towards both lower and higher ratings. These engines, comprising RD models 56, 68, 76 and 90, today cover the whole range from 3,750 up to 24,000 bhp with absolute dependability. The lowest output of 3,750 bhp is developed in the 5RD56, which, as its designation implies, is a five-cylinder unit with a bore of 560 mm; its stroke is 1,000 mm and its rating per cylinder 750 bhp at 170 rpm. The highest output is attained by the new 12RD90, a high-duty engine with twelve cylinders in line, a bore of 900 mm, a stroke of 1,550 mm and a cylinder output of 2,000 bhp at 119 rpm. All these units are single-acting reversible turbocharged two-strokes, intended primarily for single-screw vessels and for direct coupling to the propeller.

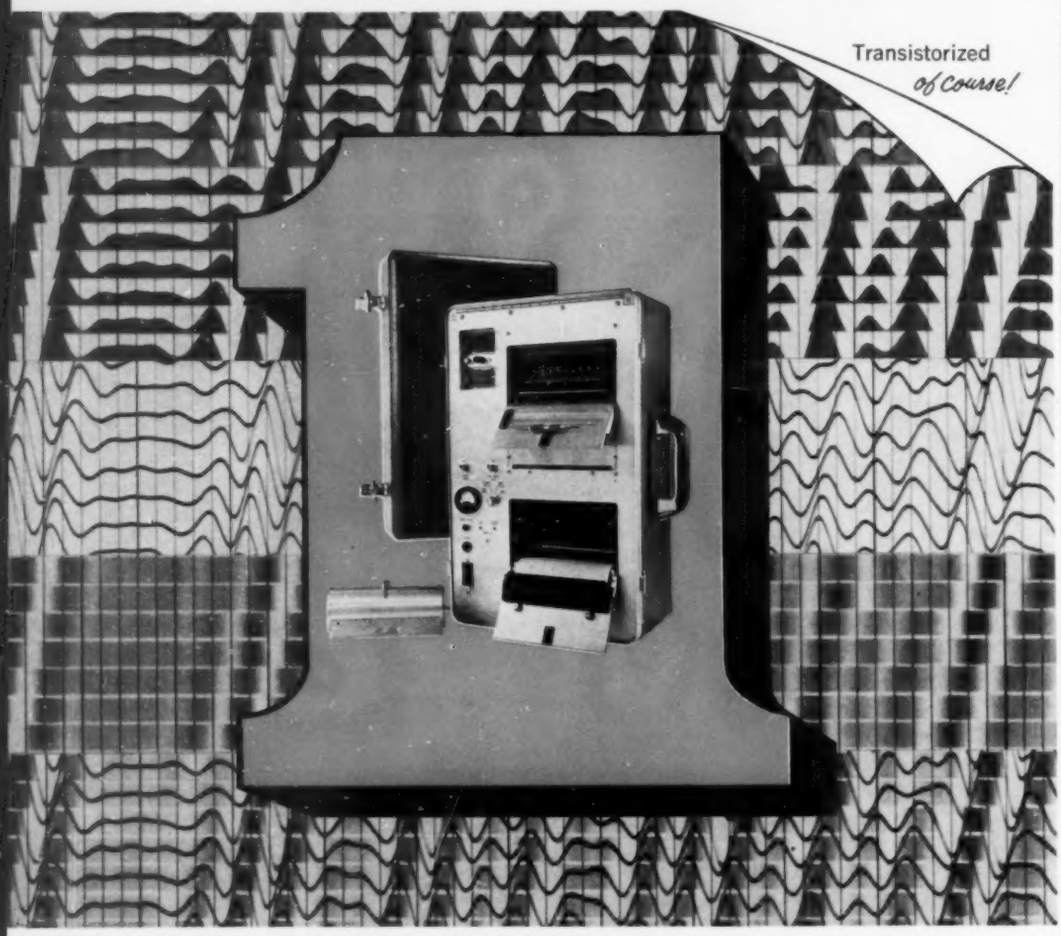
Old Gravity Should Never Die

(*Continued from page 48*)

breadth of the corresponding gravity anomaly. The influence of all density contrasts is present in the observed gravity map; however, it is difficult for the eye to perceive the individual influence of each contrast. Therefore, a mathematical means is used to isolate anomalies arising from each depth. Since there is a correlation between anomaly width and depth of influence, the average value of gravity around a circle of radius corresponding to the desired depth is subtracted from the value at the center of the circle. The resultant is known as a residual value. A residual gravity map is prepared by repeating this process on all gravity stations or at a uniform grid interval over the entire map and contouring the results. A residual gravity map reflects the influence from density contrasts occurring from the surface down to the optimum depth emphasized by the particular template. Greater depths can be emphasized by increasing the diameter of the template. A differential residual gravity map is prepared by subtracting the residual value obtained with a small template from the residual value at the same point made with a larger template. Thus, influence from below the optimum depth of the larger template and from above the optimum depth of the smaller template is removed leaving the influence of intervening zone. Thus, a differential residual gravity may can be considered as an isopach gravity map. Since the surface and shallow influences are removed from the differential residual gravity, spurious influences from errors in the original data and assumed contours in areas of sparse control will be minimized or eliminated.

In many areas several residual and differential residual gravity maps are helpful in analyzing the several zones of interest. As an example, in the Gulf Coast a residual gravity map can be prepared which will very accurately outline the caprock on piercement-type domes and reflect the structural influence of a shallow density contrast found in density logs of the area. Many shallow fault traces have been defined that correlate amazingly well with subsurface data. An underlying differential residual gravity map can be prepared which will eliminate practically all influence from the caprock and other density contrasts as at comparable depth. The salt uplifts and the so-called deep-seated salt domes, as well as other lithologic and structural phenomena within that range of depth can be emphasized. A considerably deeper differential residual to reflect the attitude and thickness of the basic salt section in the Gulf Coast area has also been found to be quite interesting and useful.

It is very probable that all old gravity data which has become lost in the files or forgotten could reveal additional valuable subsurface information if reviewed and interpreted by current methods.



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Shown here:

ABOVE: One of a fleet of "Antar" "Sandmaster 'C'" tractors with special 900 u.s. gallon capacity fuel tank operated by ESSO Standard (Libya) Inc.

TOP LEFT: A "Big Ben", one of 12 built for Halliburton Oil Well Cementing Co., to carry cementing outfits and for other duties in North Africa and Saudi Arabia.

BOTTOM LEFT: One of a fleet of Thornycroft "Big Ben" "Sandmaster" composite trucks for desert use operated by BP Exploration Co. (Libya) Ltd., in North African oil exploration.

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BRANCHES AND AGENTS THROUGHOUT THE WORLD

Review of recent USA patents on catalysts

by Heinz Heinemann and P. A. Lefrancois

In the eleven months since the last review on this subject appeared in the March, 1960 issue of World Petroleum, a great many catalyst patents have issued. There are many modifications of older catalysts, some new preparation techniques, but no real break-throughs. Petroleum catalyst manufacture, like petroleum refining, appears to suffer from a period of scientific consolidation rather than advance.

The 67 patents discussed in this review are considered representative of the major types of petroleum catalysts. The two biggest subjects in the field continue to be reforming and cracking catalysts. Reactivation of spent catalysts, beyond the point of removal of carbonaceous deposits, is receiving much attention in both areas. The industry trend toward petrochemicals is evident from the increasing number of catalysts patented for olefin production.

REFORMING CATALYSTS

The number of reforming catalyst patents is still large. The majority is concerned with preparation of platinum type catalysts, while some patents on group VI metal oxide catalysts also continue to issue. Catalyst regeneration and rejuvenation is another frequently treated subject in which there is much interest.

Three Universal Oil Products Co. patents describe methods of controlling catalyst activity. In 2,911,451, V. Haensel steams fluorine containing alumina to a surface area of 75-150 sq.m./gm. prior to impregnation with platinum. The catalyst is used for benzene production from cyclohexane and methylcyclopentane. A platinum alumina catalyst for the reduction of unsaturation and for nitrogen removal is prepared, according to Haensel's 2,930,763 by incorporation of 0.01-1% of an alkali metal. R. M. Smith and V. Haensel (2,939,847) prevent undesirably high initial activity of platinum reforming catalysts by impregnation with small amounts of sulfuric acid. After calcination this provides enough sulfur to control catalyst wildness.

A platinum alumina reforming catalyst, containing 0.1-10% gallium oxide is disclosed in M. W. Kellogg Co.'s 2,914,464 (W. P. Burton, P. A. Lefrancois and E. W. Riblett). J. H. Koch (2,922,767 to Engelhard Industries) claims a very active platinum catalyst on an alumina support, prepared from anhydrous alumina, which has been rehydrated. Special treatment of the alumina used as support for platinum is also described in Standard Oil Co.'s (Indiana) 2,925,395 (R. W. Van der Haar).

R. A. Steel (2,930,764) in another of a group of Standard Oil Co. (Indiana) patents, prepares a fluid type catalyst by grinding alumina attriting out soft material and impregnating the remainder with platinum. A high strength pellet can be manufactured according to R. V. Malo and H. M. Brennan (2,939,848). Platinum alumina is calcined and then soaked in ammonia solution at 150F., dried and recalcined. In 2,948,672, Brennan discloses an effective reforming catalyst, prepared by impregnating alumina with a chloroplatinic acid solution, containing a halogen carboxylic acid. Another catalyst preparation is described in Brennan and E. Field's 2,950,243. Here, the alumina sol is aged in ammonia and a water miscible, oxygen containing organic solvent, prior to impregnation with chloroplatinic acid.

The importance of platinum crystal size of less than 50 angstroms is discussed in Esso Res. & Eng. Co.'s 2,950,259 (C. E. Starr and M. A. Segura). X-ray treatments during calcination prevent excessive growth of platinum crystallites. M. D. Riordan, N. D. Carter and L. B. Bos (2,932,660 to Texaco) prepare a stabilized platinum-alumina catalyst by a final impregnation with aluminum nitrate solution and decomposition of the nitrate. S. G. Hindin and S. W. Weller (2,941,960 to Houdry Process Corp.) make a dual function catalyst by mixing a minor amount of silica-alumina with a major amount of alumina trihydrate; the mix is extruded, dried, calcined and then impregnated with platinum. P. B. Weisz (2,902,435 to Socony Mobil Oil Co.) discloses a mixed catalyst comprising platinum on a carbonaceous carrier and eta alumina, promoted with halogen.

Two Distillers Co., Ltd. patents (2,930,765 and 2,930,766; L. E. Cooper and G. Gower) discuss preparation of platinum group metal catalysts on supports such as pumice, magnesia and charcoal for the hydrogenation of unsaturated aldehydes.

While platinum catalysts constitute the bulk of reforming catalysts described in recent patents, there are a number of patents dealing with metal oxide and particularly with chromia and molybdena catalysts. J. Turkevich (2,886,515 to M. W. Kellogg Co.) uses phosphomolybic acid to impregnate alumina and reforms with the resultant catalyst in the presence of 0.1-10 mol-% water. C. V. Berger (2,939,837 to Universal Oil Products Co.) discloses a tungsten sulfide on alumina catalyst, containing some halogen, preferably as fluorine. A chromia-vanadia-thoria catalyst for the dehydrogenation of C_3-C_8 paraffins is proposed in Phillips Petroleum Co.'s 2,902,522 (J. R. Owen). R. N. Watts in one (2,888,396) of two Esso Res. & Eng. Co. patents prepares an attrition-resistant catalyst from an equimolar mix of molybdena, magnesia, zinc oxide, supported on an alumina base. O. Schricker (2,916,439) in the other Esso patent prescribes a special heat treatment for a molybdena alumina catalyst.

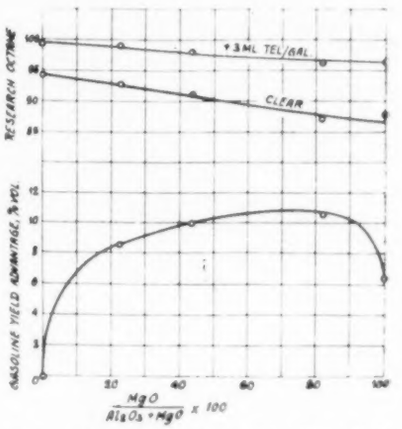


Fig. 1—U.S. 2,935,483, A. B. Schwartz; Silica-alumina-magnesia catalyst.

The art of regenerating platinum type catalysts is described in a series of patents. B. T. Borgerson (2,934,493 to Sinclair Refining Co.) strips spent catalyst with hydrogen, then burns the coke with flue gas, containing less than 10% oxygen and finally oxygen treats the coke-free catalyst in a separate zone, prior to reduction. Following the same principle, another Sinclair Refining Co. patent (2,922,766; M. F. L. Johnson, C. D. Keith and W. E. Stewart) deals with a two stage regeneration system. A one-stage regeneration and oxygen rejuvenation system on the other hand, is disclosed in R. J. Hengstebeck's 2,881,132 (to Standard Oil Co., Ind.) for a fluid type catalyst. D. R. Hoggin, R. C. Morbeck and H. R. Sanders (2,916,440 to Esso Res. & Eng. Co.) regenerate by adding HCl to an oxidative regeneration gas, to give 0.2-2.0 moles halogen/mol water and maintain Cl concentration in the catalyst at 1-1.5%. A method of regenerating platinum type catalysts, while preventing deactivation by sulfur produced by iron sulfide scale on top of catalyst bed, is described in Standard Oil Co. (Ind.) 2,923,679 (W. P. Thomson).

Two Esso Res. & Eng. Co. patents deal with regeneration of non-platinum reforming catalysts. E. W. S. Nicholson, M. A. Segura and L. Broussard (2,906,698) prevent growth of MoO_2 crystallites during reduction, following regeneration, by adding sulfur compounds to the reducing gas. W. J. Mattox (2,877,174) continuously heats a side stream of regenerated molybdena alumina to 1000-1200F. prior to recirculation to the reactor.

CRACKING CATALYSTS

A number of trends are becoming apparent in cracking catalyst patents. In the preparation of catalysts, the emphasis has

shifted from synthetic to clay catalysts. Deactivation of metals on equilibrium catalysts is receiving considerable attention. Much work appears to be going on in hydrocracking and is reflected in patents on hydrocracking catalysts.

In the area of synthetic catalysts, A. B. Schwartz (2,935,483 to Socony Mobil Oil Co.) claims preparation of a silica-alumina-magnesia catalyst, containing 19-25% Al_2O_3, 8-15% MgO, with the remainder SiO_2. This catalyst shows a major yield advantage over silica-alumina at equal coke level (see accompanying graph in Fig. 1). Similar performance claims are made for a beryllia-boria catalyst, containing 30-50% beryllia, the preparation of which is described in Esso Res. & Eng. Co.'s 2,916,436 (E. G. Baker). G. R. Gilbert in another Esso patent (2,916,437) discusses a synthetic zeolite catalyst, comprising 12-13% Na_2O, 21-22% Al_2O_3 and 65-67% SiO_2. This catalyst gives high middle distillate yields.

A semi-synthetic catalyst is disclosed by E. J. Houdry in 2,921,034 and 2,921,035. Non-gelatinous, synthetic silica-alumina is ground in a colloid mill to less than 50 micron size, mixed with clay in a proportion of between 60:40 and 85:15, pelleted, dried and calcined.

Many patents deal with clays. The following are typical: Kaolin clay is activated, according to Houdry Process Corp.'s 2,934,504 (G. Talvenheimo) by treatment with conc. H_2SO_4 in the presence of at least 2% of an acid miscible saturated organic hydroxy compound. R. B. Secor and E. S. Peer (2,935,463 to Filtrol Corp.) treat a kaolin clay with hydrous alumina, containing 0.5-10% SO_3. The hardness of a sulfuric acid treated kaolin is increased, according to W. W. Gary (2,925,393 to Minerals & Chemicals Corp. of America) by aging for 1-24 hours in mineral oil, containing an antioxidant, such as di-tertiary butyl para cresol. In another Mineral & Chemicals Corp. patent (2,941,959) E. W. Greene and A. P. Allegrini mix kaolin with H_2SO_4, pellet and mix the pellets with fine sand to transfer heat and cause reaction at 220-325F. A. E. Hirschler in one of two Sun Oil Co. patents (2,928,785) contacts natural clay with 1-20 wt-% HF. He then leaches with aluminum nitrate solution to lower the fluorine content below 1%. In the other patent (2,949,421) I. W. Mills treats acid activated clay with benzene, to remove sulfur.

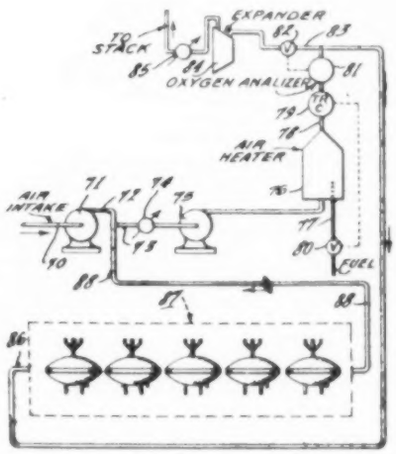


Fig. 2—U.S. 2,915,570, B. Busch-Petersen, J. J. Cicalese, and R. G. Craig; Regeneration of butadiene catalyst.

Problems of metal deactivation on cracking catalysts are treated in three Phillips Petroleum Co. patents. C. J. Helmers and C. R. Turvey (2,921,018) treat contaminated catalyst with phosphoric acid to convert metals to phosphates. A. N. de Vault (2,946,740) passes chromyl chloride vapors over regenerated catalyst at 700-1050F. to deactivate metal poisons. P. H. Johnson and C. R. Eberline (2,947,684) continuously replace metal contaminated with uncontaminated catalyst. J. M. Bourgue and J. P. Harrison (2,951,030 to Socony Mobil Oil Co.) remove nickel impurities from a moving bed catalyst by a method of selective surface abrasion.

Hydrocracking catalysts are described in three Phillips Petroleum Co. patents. R. J. Hogan (2,926,130) impregnates 1-10% nickel and 0.01-10% silver on a porous support, such as gamma-alumina or silica-alumina. In 2,946,738 L. E. Gardner and R. J. Hogan impregnate gamma-alumina with vanadia, followed by cobalt and molybdenum oxides. After calcination and reduction, the catalyst is sulfided. A new composition for a modified cobalt molybdate catalyst is disclosed by Gardner and Hogan in 2,946,739. It comprises 0.1-1% rhenium, 1-5% cobalt and 3-10% molybdena on alumina.

ISOMERIZATION CATALYSTS

While only relatively few new patents have issued in this area, it is interesting to note that they are no longer restricted to precious metal catalysts.

H. O. Folkins and M. J. Geerts (2,926,207 to Pure Oil Co.) employ a silica-alumina-zirconia support with 0.5-8% nickel as the active component. A phosphate of aluminum, beryllium, calcium, magnesium, zirconium or strontium is added for stability. H. M. Stine and J. L. Callahan (2,945,908; 2,945,909 to Standard Oil Co., Ohio) describe isomerization catalysts comprising silica-alumina and chromia. An aluminum chloride hydrocarbon complex is the catalyst used in I. A. Peterson's 2,945,910 (to Phillips Petroleum Co.). Separation of hydrocarbon and complex phases is facilitated by the addition of 0.3-10 wt-% finely divided barium sulfate. A mixed catalyst consisting of platinum-alumina and silica-alumina is disclosed in Socony Mobil Oil Co.'s 2,892,003 (P. B. Weisz). The catalyst component particles must be of less than 100 microns diameter. C. B. Linn (2,921,032 to Universal Oil Products Co.) employs HF over a complex of boron trifluoride and chromium fluoride for butane isomerization. Preparation of the solid complex is described.

HYDRODESULFURIZATION AND HYDROGENATION CATALYSTS

A few catalysts of this type have already been described among the hydrocracking catalysts. C. E. Adams and C. N. Kimberlin (2,918,427 to Esso Res. & Eng. Co.) prepare a hydrodesulfurization catalyst by presulfiding a platinum hydrogenation catalyst to a mole ratio of 1.5:1 S/Pt.

A catalyst of the Raney nickel type, but claimed to be more active, consists of a nickel molybdenum alloy. R. L. Hadley (2,948,687 to General Electric Co.) treats a nickel-aluminum-molybdenum alloy in strong caustic to leave the porous catalyst. An activation procedure for a nickel-aluminum alloy is proposed by C. K. Rosenbaum and J. C. Tallman (2,950,260 to Du Pont de Nemours & Co.).

A number of patents deal with the selective hydrogenation of acetylene in olefin streams. J. G. E. Cohn, A. J. Haley, Jr. and H. A. Shields (2,927,141 to Engelhard Industries) describe a catalyst, comprising 0.001-0.0035% palladium on activated alumina, promoted with 0.001-5% rherium, silver or iron. A method for preparing a 0.01-0.9% palladium on alumina catalyst is contained in Chemetron Corp.'s 2,946,829 (M. Likins, J. F. Strotman and D. D. McCarthy).

POLYMERIZATION CATALYSTS

An interesting catalyst for the polymerization of α-olefins is claimed in Esso Research & Eng. Co.'s 2,925,392 (C. W. Seelbach and W. J. Gilbert). Titanium tetrachloride is reduced with metallic titanium at 350-600C. and 5-100 atm. pressure to yield violet, crystalline titanium trichloride plus 5-25% titanium. This material is powdered and suspended in an inert liquid, prior to adding a solution of aluminum alkyl.

OXIDATION CATALYSTS

The number of hydrocarbon oxidation catalyst patents is quite small, but increasing. The majority seems to be directed toward air pollution problems. E. J. Houdry (2,921,033 to Oxy-Catalyst, Inc.) describes a method of producing hard, attrition resistant, molded pellets. A vanadia-potassium sulfate-silica catalyst and its preparation is disclosed in 2,941,957 (P. H. Pinchbeck and F. B. Popper to Coal Tar Research Assoc.).

CATALYSTS FOR BUTADIENE PRODUCTION

Interest in butadiene and isoprene by catalytic dehydrogenation has been increasing and more new patents are issuing than a couple of years ago. The following are typical: W. E. Armstrong and J. N. Wilson (2,940,940 to Shell Oil Co.) improve the crushing strength of Fe_2O_3 K_2CO_3 olefin dehydrogenation catalyst by treating the calcined pellets with wet CO_2 gas at less than 100C. A catalyst composition, comprising

(Continued on page 79)

INTERNATIONAL NEWS AND NOTES

ARGENTINA—Argentina's President Frondizi has announced his country will be self-sufficient in gasoline, fuel oil and natural gas early in 1961, a year ahead of schedule—citing in support of his belief that oil imports during 1960 were reduced 42.5%.

ARGENTINA—On acreage the company obtained two years ago in Buenos Aires province, Shell has spudded wildcat Los Gauchos No. 1, three miles south of the city of Buenos Aires. On other new acreage, in Rio Negro province, the company previously drilled three tests.

ARGENTINA—Temporarily at least, Union Oil Co. of California has decided to discontinue exploration in Latin America after having drilled nine dry holes on its wholly owned four-million-acre tract in the Comodoro Rivadavia area of Argentina. Union also is reported to have discontinued for the present operations in Guatemala, and in Costa Rica on a 50-50 block with Gulf. The company will concentrate on Australia, where a wildcat had gas shows, and in the Spanish Sahara.

AUSTRALIA—A Dallas, Texas, company—Overland Industries Inc.—was to begin preliminary exploration at year-end 1960 on a concession it had obtained over 3.2 million acres in the Murray River basin of New South Wales.

AUSTRALIA—Union Oil Co. of California is about to begin an extensive aeromagnetic survey. The 40,000-mile $300,000 survey will be conducted by Union's Australian affiliate, Union Oil Development Corp., over concessions in southern Queensland and northern N.S.W. Earlier in 1960, Adastra Aerial Surveys, of Sydney, conducted an 11,000-mile survey for Union in Queensland. The same firm will conduct the new survey.

AUSTRALIA—The Australian Bureau of Mineral Resources has contracted with Geophoto Services, Inc., Denver, Colorado, U.S.A. for photogeologic evaluation of several areas in Australia and for associated technical training activities. John Perry, a Bureau geologist, recently spent several months at the Geophoto offices in Denver as part of a period of overseas training in photogeologic techniques. W. D. Mott, consulting geologist at Brisbane, Australia, has been appointed representative of the Geophoto Group in that country.

AUSTRIA—Austrian state company OeMV will invest this year 634.3 million Schilling ($25.4 million), i.e. 14% less than in 1960. This decrease is due to the completion of the new Schwechat refinery, which permitted reducing investments in processing from $19.2 million in 1960 to $11.8 this year. $4.6 million has been earmarked for drilling; total footage is to reach 538,100 ft (1960: 587,300 ft); exploration 131,240 ft (144,000 ft), production 156,900 ft (123,000 ft), extension 84,350 ft (49,200 ft), others 62,400 ft (72,200 ft). Investments in the gas industry have been trebled to $2.6 million this year, of which $1.6 million alone are to be spent on the development of the new gas field at Aderklaa. Planned is the construction of a 35.3-million-cubic-feet-per-day desulfurizing plant, which is to be completed in 1962.

AUSTRIA—Under an agreement signed in Dornbirn, Austria, on November 29, 1960, ENI's subsidiary SNAM (Societa Nazionale Metanodotti) obtained permission to lay a 21.45-in. eight-million-ton-per-year crude pipeline from Genoa, Italy, across Vorarlberg, Austria's westernmost province. In exchange, SNAM will preferentially supply the Austrian province with products and transport up to a million tons per year (20,000 b/d) of crude from Vorarlberg to the nearest refinery in southern Germany should oil be discovered within the Austraian province. SNAM also has agreed to transport foreign crude through its pipeline to Vorarlberg should the latter obtain such crude cheaper than from ENI.

The projected line will start in Genoa, Italy; cross eastern Switzerland; enter Vorarlberg at St. Margarethen and leave the province at Laiblachtel in the direction toward the terminal at Ingolstadt. A branch line probably will go to the Stuttgart area in Germany.

Under the agreement, ENI's distribution subsidiary AGIP has permission, and plans to erect 20 filling stations in the Austrian province of Vorarlberg. With a goal of 300 to 400 stations eventually, AGIP will obtain a 15% share of Austria's liquid-fuel market.

Construction of the line must begin within the next three years, according to the agreement, with the line completed within three years. Vorarlberg plans to start building in 1961.

The crude contingents allocated to Vorarlberg under the agreement will be 200,000 to 300,000 tons per year; the Swiss cantons of Tessin and Graubuenden will receive 300,000 tons each, and St. Gallen 400,000 tons.

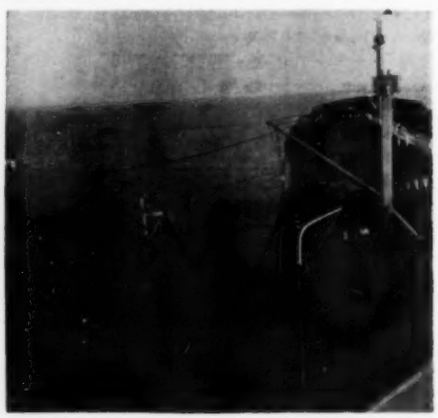
The pipeline is to be constructed and operated on Swiss and Austrian territory by a stock company headquartered at Chur (Switzerland). The respective shares in the stock company will be as follows: the provincial governments of Tessin, Graubuenden, St. Gallen, and Vorarlberg, 18%; industrial enterprises in these areas, 17%; the remaining 65% will be divided between SNAM and "Suedpetrol." The latter company is owned 50% by SNAM and 50% by a German banking consortium. The pipeline will be constructed and operated by SNAM in Italy and by Suedpetrol in Germany.

CEYLON—If a bill now before parliament passes, Ceylon will set up a State agency to import and market oil in competition with established private companies. With initial capital of $2.1 million, the government company would be exempt from income taxes.

CHILE—ENAP (Chilean government oil entity) was slated to spend two wildcats in the extreme north of the country early in January 1961—one at Pintados in Tarapaca, most northerly Chilean province; the other near Salar Pedernales in Atacama province directly to the south. Loffland Bros. (which has a contract covering two or three 9,000-ft to 10,000-ft tests) will drill the Pintados test; and Santa Fe Drilling Co. (which has a contract for six or seven 6,000-ft tests) will drill at Salar Pedernales. ENAP continues to explore in the extreme south, where it is producing about 22,000 b/d from its fields in Chile's part of Tierra del Fuego island.

CHINA—An acute shortage of petroleum and products is reported from Red China, believed by Western observers to be a result of calculated Soviet economic pressure. Most of China's petroleum is supplied by the Soviet Union. The shortage appears to be growing ever more acute as the scale of Chinese industrialization increases. Strenuous measures are now being taken to meet the situation. They include cuts in public transport services. There has also been noticed a marked reduction recently in the activity of Chinese jet fighters when trying to intercept Nationalist Chinese reconnaissance planes. China's jet and aviation fuel is provided entirely by the Soviet Union.

Despite progress in the development of the Red Chinese oil industry, the demand in liquid fuel surpasses by far the domestic output. In 1960 the plan provided for an output of 5.8 million tons of crude, i.e. 1.7 million tons more than in 1959. To date, 32 oil fields and 18 gas deposits have been explored, of which three-fourths were discovered during the past three years.



Standard Vacuum Oil Co. has installed a Hartley hoister for unloading crude supplies for its new Bataan refinery near Limay, Philippines, to eliminate a costly pier in Manila Bay. A trussed boom, with one end hinged to a submerged platform, carries four 12-inch sea hoses capable of handling 50,000 bbl/hr of crude from tankers with capacities ranging up to 100,000 dwt. Air tanks lift the boom to the surface when a cargo is to be unloaded. First Hartley hoister was installed at Kuwait for temporary use while a pier was being built.

CUBA—The Russians, with eight Soviet drilling rigs in the field, are reported to have encountered oil shows recently in several horizons near the Cuban coast. Fourteen more Soviet rigs are to be delivered to Cuba during 1961.

CUBA—Russia has expressed willingness to buy 2.7 millions tons of Cuban sugar—roughly half the crop—if the USA continues to refuse to buy sugar from Castro's regime. Under an agreement signed in July 1960, Russia is buying about a million tons of Cuban sugar annually—with Soviet oil flowing to Cuba under the same pact.

ECUADOR—Mobil Oil Co. del Ecuador is about to start operations, according to Jorge Mejia, regional executive of Mobil International Oil Co. The new company, Socony Mobil's youngest affiliate, will market lubricants and related products. It will have headquarters in Guayaquil and a district office in Quito. General manager and vice president of Mobil Oil del Ecuador is Arthur L. Scharf, formerly district manager in southern Chile. Sales manager is Paul Hofstetter.

EGYPT—The Egyptian government publication *Arab Review* reports that the Petroleum Cooperative Socy. has increased its share of local distribution to 40% of Egypt's oil consumption. The government-owned cooperative now has a total of 1½ million tons, up from one million in 1957 and only 70,000 in 1951. It operates 132 filling stations, and also has a stake in COPE, the 49% Egyptian-owned producing company in Sinai. The other 51% is owned largely by Petrofina and Italy's ENI.

FRENCH SAHARA—Oil men in London, Paris, and Algeria now predict more realistically that Saharan oil output by 1965 will be somewhere between 520,000 and 630,000 b/d instead of over a billion b/d as predicted over-optimistically by French officials earlier. Saharan production in 1960 was running about 130,000 b/d. An Esso subsidiary spokesman in Algeria believes that, if output is no more than 630,000 b/d by 1965, oil companies will be able to dispose of the production without the help of the French government.

FRENCH SAHARA—During 1960 alone, France invested some $320 million in Saharan oil, on top of the $620 million which had been invested previously (total $940 million). French reluctance to let go of the Sahara is increasing as the nation's economic stake in the area grows. If Algeria eventually is partitioned, the French would insist on a corridor running through northern Algeria to the Mediterranean. The now heavily guarded pipelines through this area would be even more vulnerable than the oil wells themselves in the desert.

GERMANY (West)—Under a proposed new three-year Soviet-West German trade pact, the Russians threaten to refuse to buy $80,000 worth of West German steel pipe unless the Germans agree to treble the amount of oil they will buy from the Russians. Under the three-year pact which expired at year-end 1960, West Germany had agreed to take 4½ million tons (about 30,000 b/d) of Soviet crude; this the Russians want boosted to 12 million (80,000 b/d).

INDIA—India is expecting about 100 Soviet oil experts who are to train Indians and help accelerate the exploration for oil so that India may become self-sufficient in petroleum products within 5-7 years. With Soviet assistance the third oil deposit was recently discovered at Rudrasagar. Previous finds were at Kambey (September 1958) and at Ankaleshvar (June 1959).

INDIA—New Delhi dispatches report that Indian oil officials—though they still prefer a 60-40 profits split in exploration agreements with foreign oil companies—are ready to settle for a 50-50 split under certain conditions. The government has applications pending from a number of oil companies, and will consider each on its own merits. However, it balks at insistence of some companies that they also receive refining rights.

IRAN—Iranian Oil Operating Companies' SURU No. 1, drilling near Bandar Abbas on the Straits of Oman, reached 13,711 ft on December 3 to become the deepest ever drilled in Iran. Drilling continues.

IRAQ—Mohammed Salman, an Iraqi, has been appointed as Iraq's oil minister, a post he had been offered months ago. Until his new assignment, Salman was director of the Cairo-based Arab League's oil department which he had helped found in 1954.

JAPAN—Oil consumption in Japan, now about 475,000 b/d, is expected to rise to at least 800,000 b/d in the next five years. At least 60% of the Japanese market is supplied by international companies, with 40% by Japanese-controlled independent firms. With oil demand rising in Japan's rapidly expanding industrialization, international oil marketers express no concern that Japan will not be able to absorb the crude from her Persian Gulf concession without seriously disturbing the present marketing ratio.

JAPAN—Ostensibly to fulfill in part the concession obligation for integrated international operations on the part of the Japanese-owned Arabian Oil Co., which holds Neutral Zone offshore rights, permission is being sought for formation of a Kuwaiti-Japanese trading company—51% to be held by Kuwait Oil Tanker Co. and 49% by a Japanese tanker company headed by Arabian Oil Co.'s president Taro Yamashita.

JAPAN—First DuPont investments in the Far East are represented by a new joint $18 million company in Japan to produce polyethylene. Called Mitsui Polychemicals Co. Ltd., the company is owned 50% by Mitsui interests and 50% by DuPont. A similar joint venture by DuPont in Japan is with Showa Denko to produce neoprene.

JAPAN—Teikoku Oil Co. has purchased from Russia the first turbodrills for use in Japan. The 6⅝-in. turbodrills, designed for development work, were to begin in January to drill 3,900-ft to 6,500-ft oil and gas wells in the Katamachi field of Niigata prefecture.

LIBYA—No. 1 Raguba is a 500 to 800 b/d discovery in Libya by Esso Sirte and Libyan-American, first on their Block 20. Recently the well tested 42-gravity oil from a 105-ft porous section—the first drill-stem test having been at 5,300 ft. The operator, Esso Sirte, holds 50% in the block; Libyan-American (Texas Gulf Producing subsidiary) 25.5%; W. R. Grace & Co. the remainder.

LIBYA—In the future, permits will be granted to foreign drilling contractors or service companies for work in Libya only if no local company is available to do the job.

MEXICO—Tennessee Gas Transmission and Southern California Edison Co. have filed applications with FPC in Washington, D. C., seeking authorization to export and import natural gas through the proposed $225-million, 1,600-mile pipeline from Texas to California via Mexico. Southern California Edison recently signed a contract with Humble Oil & Refining to buy gas in South Texas. The big utility will then pay transportation charges to carry the gas through the new line to California and burn it to generate electricity.

MEXICO—A new international drilling corporation, Constructora Otila, S.A., has been formed between American and Mexican interests. Its first contract is to drill for Petroleos Mexicanos, S.A., in northeast Mexico. Administration will be by officials of Continental Drilling Co., of New Orleans, and some of the leading Mexican drilling contractors and engineers. Offices have been set up in Reynosa and Mexico City.

Federico Stoffel, Mexico City, is president and general manager of Constructora Otila, S. A. Marshall Smith, Sr., of Continental Drilling Co. will be in charge of the Mexico City office. Joseph M. Rault, Jr., New Orleans, of Continental Drilling Co., will be in charge of coordinating the activities of Constructora Otila and Continental Drilling.

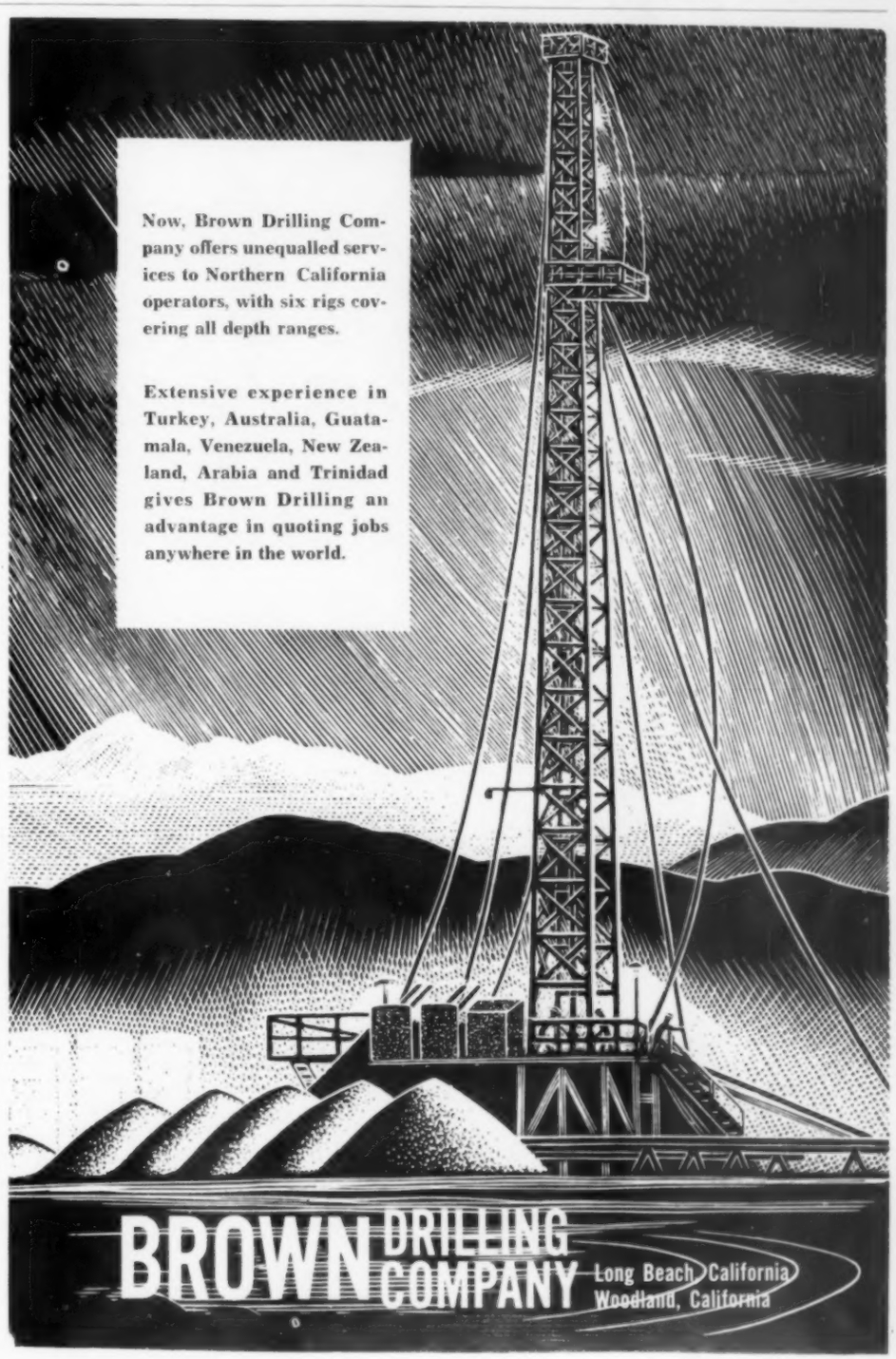
NEUTRAL ZONE—If plans by the two interested governments gel, the exploration areas in the Neutral Zone which lie between Saudi Arabia and Kuwait will be divided between the latter two nations, thus abolishing the buffer zone. Tentatively, the new common boundary would lie on a geographical line drawn through the middle of the Neutral Zone and its Persian Gulf waters. International oil companies affected by the projected split include Getty in Saudi Arabia's onshore share; American Independent in Kuwait's share; and the Japanese-owned Arabian Oil Co. with offshore rights in both shares of the zone.

NEUTRAL ZONE—Japan's costly Persian Gulf field offshore the Netural Zone is estimated by 1965 to have cost the operator, Arabian Oil Co., at least $31 million for crude-oil production, plus $11 million for other facilities. In addition, the Japanese are committed to the building of a refinery in the area to process 30% of the output, estimated to cost $50 million.

NIGERIA—Mobil Oil has abandoned No. 1 Ojo at 6,326 ft, its second test in the country. The company will spud a third Nigerian test, No. 1 Illepaw, 45 miles west of Lagos, in the southwestern corner of the country, three miles from the Dahomey Republic border.

PAPUA—Australasian Petroleum Co. has abandoned its search for oil in the Iehi site in Papua's rugged Gulf country. Water had been found at 5,575 ft and dry gas at 4,708 ft. Iehi fas APC's 17th unsuccessful deep bore drilled in the company's 22-year-old $75 million search for oil in Papua.

PAPUA—Work has begun on the first major effort to find oil in off-shore Papua-New Guinea waters. A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British firm, Seismic Surveys Ltd., has arrived in Port Moresby, Papua, to make an underwater survey of the 9,600 square miles of the Papuan Gulf. The survey extends for 300 miles from Orio, just north of Port Moresby to Mibu Island on the southwest coast of Papua. The survey which will cost 600,000 dollars will begin in January.

The survey party already has begun preliminary work. A spokesman for the Administration's mining division said a permit for oil exploration in the gulf was held by an American-backed company, Camelot Nominees Pty Ltd. The permit was granted to the company in May last year and had recently been renewed for another three years.

POLAND—Two recently signed agreements with Italy are to promote the cooperation between both countries in the field of petrochemistry. The trade agreement that will terminate in December 1964 provides among others for Polish deliveries of 1,000 tons of benzene, 1,000 tons of naphthalene, and 1,000 tons of carbon black while Italy will deliver inter alia 500 tons of butanol and 500 tons of furfural. Another agreement provides for the delivery of industrial installations in the value of $30 million. Italy is to deliver $5 million worth of petrochemical installations. This deal is primarily the outcome of the recent visit to Poland of ENI-Director E. Mattei.

Due to the recent discoveries of relatively rich gas deposits in Poland, the gas industry is now being developed at a faster pace. In 1960 100 miles of gas mains and 44 miles of distribution lines were laid in towns. Footage to be drilled this year for oil and gas is to be 519,380 ft, of which 453,760 ft is for exploration and geology.

PORTUGUESE GUINEA—Esso will spud a second Portuguese Guinea test approximately 20 miles west of its first wildcat near Joao Landim, which was abandoned at 3,244 ft. Esso holds rights to the entire province of Bissau.

RHODESIA—(Federation of Rhodesia and Nyasland)—Another American firm, Bardahl International Oil Corp., will market specialty products and grease in Rhodesia, under its own brand name.

ROMANIA—Romanian gas production in 1960 increased by 15.9% to 236,577 mmcf, from 204,162 mmcf in 1959. No figures have been given yet for the crude production. Last year six new chemical plants and 18 chemical and oil processing units went into operation. The country's first catalytic cracking plant —with a capacity of 5,000 b/d—was commissioned at Onesti refinery. Compared with 1959, last year's output of gasoline increased by 110,000 tons to 2.8 million tons, and of gas oil by 100,000 tons to 2.3 million tons. This year are to be commissioned a catalytic reforming plant and a gas fractionating plant at Brazi refinery, a coking unit at the Borzesti refinery, and construction is to start of a gas processing plant at Craiova.

ROMANIA—The recently signed trade agreement between England and Romania provides for delivery to Great Britain of Romanian oil-field equipment valued at £100,000 (about $280,000), the first postwar trade agreement between the two countries.

TRINIDAD—Pan American International has incorporated a Trinidad affiliate in Delaware, Pan American Trinidad Oil Co.

TURKEY—A draft amendment, by the new interim government, to Turkey's foreign investment law would grant foreign investors freedom to import raw materials and components, and to transfer profits out of the country. The new administration has formed a State planning board to coordinate foreign and local capital investments, and is trying to simplify the myriad rules and regulations which have hampered investment.

TURKEY—The Los Angeles-based Pauley Petroleum Co., which recently obtained rights to a 30,000-acre tract in south-central Turkey, is expected during 1961 to drill a wildcat in the Iskenderun basin along the Mediterranean, close to Mobil's Bulgurdag discovery. Pauley, a relative newcomer to Turkey, last May acquired 700,000 acres in Turkey under three licenses.

URUGUAY—Uruguay is expected soon to announce details of conditions and tenders under its new policy to invite foreign firms to bid for exploration contracts. However, Uruguay—which lacks money, equipment, and know-how for more extensive exploration—will not discontinue its efforts under Ancap, the government oil monopoly.

USSR—Russia now ranks third as the world's crude producer after the USA and Venezuela. Her announced goal for 1960 was in excess of 2,800,000 b/d. In 1959, total Russian output was 2,500,000 b/d, or about 13% of world output. Two-thirds came from the major fields of the Volga-Ural region, more than 1,000 miles east of Moscow, developed in 1957-58.

Russia's oil shipments now make up 2% to 3% of Free World imports—expected to rise with increased Soviet crude output. Russia's 1960 exports—swollen by shipments to Cuba—are estimated at 350,000 b/d. However an international oil company estimates Russian oil available for export to the Free World is increasing at a significantly greater rate than Soviet tanker availability.

USSR—Soviet 1961 crude output is to reach 164 million tons, i.e. 11% more than in 1960. The production target for Azerbaidzhan was set at 18.5 million tons of crude and 229.5 million cubic feet of gas. In view of the past performance, the Soviet oil industry is supposed to reach the target of the current 7-year plan (1959-1965) three years earlier.

In Tartaria, which has a geological structure similar to Texas, two drilling crews reportedly averaged 104,990 ft in 1960, compared with 85,306 ft of a crew in Texas. The average footage drilled in the area of Tatraria, where the record was established, is said to be 100,070 ft per crew. This year, more slim holes are to be drilled and the average footage drilled by a crew is to reach 104,990 ft.

The latest estimate of the Soviet gas reserves put the figure at 21,700,000 million cubic meters (766,227,000 mmcf), 85% of it concentrated in 17 deposits. To date about 200 gas deposits have been discovered.

This year 2,129 miles of gas pipelines and 1,860 miles of oil pipelines are to be laid.

A Radio Moscow broadcast, beamed to Arab countries, refuted Western reports according to which the USSR has increased its oil exports in competition with Arab oil. Yevgeniy Gorov, chairman of the Soviet Oil Export Co., denied that he had declared at the recent Arab Oil Conference in Beirut that the USSR intends in the next few years to dominate 19% of the oil market in Western Europe. He said he had mentioned this figure in connection with the USSR's share in the West-European market before World War II. "However," he added, "Russia has been exporting oil for more than 80 years; this fact also gives us the right to occupy a significant position among the present oil exporters." As for future Soviet oil exports, Gorov said that they will "increase as in the past years, but not through competition with Arab oil but through the increase of world oil consumption—our exports will never hurt Arab oil exports."

Despite Gorov's protestation, the USSR is continuing to expand its oil exports, undoubtedly at the expense of Arab countries. Soviet oil deliveries to Finland will increase this year to 900,000 tons of crude (1960: 650,000 tons), 650,000 tons of fuel oil (400,000 tons), and 600,000 tons of gas oil (375,000 tons). The USSR will thus cover more than half of Finland's demand.

West Germany's consignment this year will be up 300,000 tons over last year's. The USSR will deliver 1.7 million tons of crude oil, 425,000 tons of fuel oil, 275,000 tons of Diesel fuel, 110,000 tons of motor gasoline, and 10,000 tons of lube oils.

The Soviet Union recently started in Denmark an advertising campaign for petroleum products with the apparent intention of tempting Denmark to exploit the 500,000-ton oil quota, agreed upon in the 2-year trade agreement of June 1959.

VENEZUELA—Venezuela's National Economic Council is circularizing oil companies within the country for their views on Venezuela's newly proclaimed oil policy which would limit oil exports so as to hold up prices.

VENEZUELA—By evaluation testing, Creole has extended the Aguasay trend in eastern Venezuela. Acema No. 1—taken to 13,207 ft on an 89,000-acre tract in Monagas—tested four zones: S-4 sand, through a ½-in. choke had an initial flow of 1,945 b/d of 24.9-gravity crude with a gas-oil ratio of 857:1. The remaining three sands (all R-1) initially tested, respectively, 977 b/d of 31.3-gravity; 1,303 b/d of 31.3-gravity; 1,556 b/d of 31.2-gravity.

Earnings Generally Up

Gulf Oil Corp. expects 1960 net earnings of some $320 million to be up about 10% over 1959, highest actual operating income since 1957 and second highest in the company's 60-year history. Gulf's capital outlay for 1960, scaled down from a previous estimate, will work out to about $350 million "spent or committed," exclusive of exploratory drilling—up from $335.7 million in 1959 and down from $401 million in 1958 and $546 million in 1957.

Signal Oil & Gas estimates net earnings for 1960 slightly ahead of 1959's $16.2 million, or $1.71 per share. The company denies it is contemplating merger with a larger firm.

Honolulu Oil Corp. sees a drop in its 1960 fourth-quarter net to around 60c per share from 76c in the like 1959 period. The company ascribes the fall to lower crude prices, a stepped-up development program, heavier writeoffs for depreciation, depletion, amortization, and abandoned wells.

Atlantic Refining Co.'s earnings for 1960 are estimated at $4.25 per share, up from $3.19 in 1959—with further improvement anticipated for 1961 based on operating efficiencies and prospects of higher oil prices.

Standard of New Jersey's volume is running 5% ahead of a year ago, which means 1960 sales will set a new high, said president Rathbone, and the largest since 1957 when they amounted to $4.08 per share. In 1959 SONJ earned $2.93 per share. World refinery runs were up 2% in the first 10 months of 1960, but were down 4% in the USA, reflecting steps to balance inventories.

Kern County Land Co.'s 4th 1960 quarter net income was estimated to come close to matching the $1.07 per share earned in the like 1959 quarter—giving the diversified company 1960 profit of over $3.60 per share, down from $3.86 reported for 1959.

World Tanker Fleet

The world fleet of oil tankers (100 tons gross and upwards) now totals 41,465,102 tons, according to Lloyd's Statistical Tables 1960, representing a rise of 3,575,418 tons (9.4%) over the year before. Details of leading fleets are in 1,000 tons gross:

Liberia	7,183	Wn. Germany	560
Great Britain & N. Ireland	7,050	Spain	450
Norway	6,373	Argentina	343
United States	4,634	Brazil	297
Panama	2,500	Venezuela	258
France	1,858	Finland	170
Italy	1,726	Belgium	158
Japan	1,569	Mexico	124
Netherlands	1,357	Portugal	123
Sweden	1,318	Other British Commonwealth	330
Greece	916	Other foreign	603
Denmark	872		
Russia	693	Total	41,465

Tanker fleets at June 1960 represented 32.0% of all steam and motor ships (129.8 million tons gross) against 30.3% the year before. The principal rises in tanker fleets over the year were as follows (in 1,000 tons gross): Great Britain and N. Ireland, 661; Greece, 590; Norway, 444; United States, 294; Japan, 267; France, 179; Italy, 120; Netherlands, 110, and Liberia, 105. The large rise for the Greek fleet raises to 11th from 14th in world ranking. Great Britain has four vessels of 30,000 tons and over, totaling 124,331 tons, against one of 36,904 tons for the USA. Liberia has 22 totaling 931,927 tons and France six totaling 186,202 tons.

Intrastate Lines Grow

Because prices of natural gas which does not cross state lines are exempt from FPC regulation, major oil companies in recent months have expanded their intrastate natural-gas systems. Continental Oil Co. has announced completion of a $4.5-million natural-gas pipeline in Louisiana and start of a $2-million expansion of natural-gasoline production in the same area.

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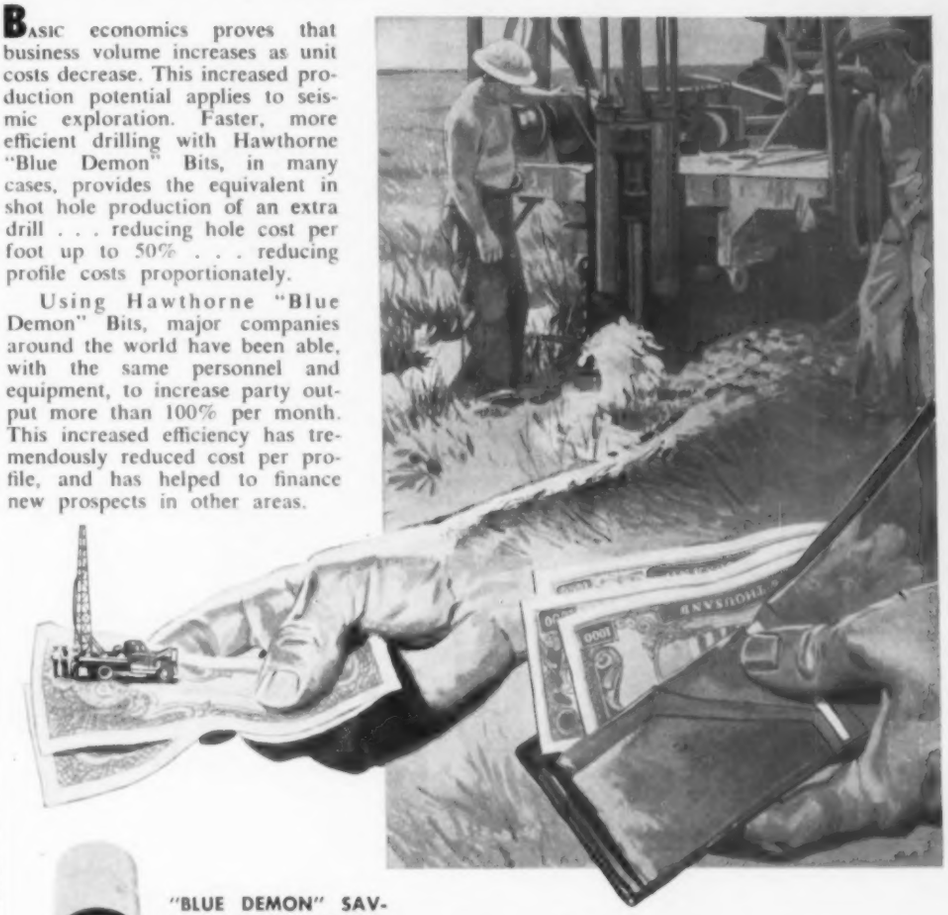

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by William C. Uhl
Processing Editor

Highlights of the month—"closed-loop" computer control to be applied to Fluid unit; new and better methods to test anti-knock seen on the way; new liquid purification process for removing hydrogen sulfide

Processors can expect to see more and more use of computer control in the coming years. Just last fall, details were reported in this magazine of a computer-monitored, 140,000-b/d crude distillation unit at the Whiting refinery of Standard Oil Co. (Indiana); (WORLD PETROLEUM, December, 1960, pp. 68-75).

And now, an announcement has been made by Gulf Oil Corp. that it will use a "closed-loop" automatic computer to control a 60,000-b/d Fluid catalytic cracking unit at its Philadelphia refinery early this year. A Thompson Ramo Wooldridge digital type, the RW 300, will provide automatic control of two major, and significant, process variables—reactor temperature and recycle ratio.

In a "closed-loop" system, the variables are maintained at an optimum level by a feedback of signals to the proper valves from the computer on the basis of operating values which are fed automatically into the instrument.

A joint study by Gulf and TRW technologists, begun in October, 1959, has indicated that the use of the RD 300 will increase operating efficiency of the catalytic cracking unit up to 95% of theoretical, primarily through closer control of these two significant variables—reactor temperature and recycle ratio.

In some previous process control applications, this instrument has established a reliability level of more than 99.5%. It is a transistorized digital computer, with built-in analog-to-digital conversion equipment.

In addition to the process variables mentioned, end point and process stream analyzers are being installed to supply complete and current information to the system. Initially, the system will have about 150 analog and digital inputs, plus provisions for further expansion.

Besides the increased operating efficiency to be obtained from the installation, Gulf anticipates other equally valuable benefits: (1) the basic knowledge of commercial operations to be derived from this unit will make possible improved operating techniques and mechanical design in both existing and future units; and (2) use of the system will help the company develop "know-how" in the field of computer control.

Industry's efforts to find new and more realistic methods of determining gasoline's anti-knock quality seem to be producing satisfactory results, based on some of the reports made at the 1961 International Congress of Automotive Engineering, sponsored by the Society of Automotive Engineers in Detroit in January.

The present Research and Motor Methods of knock-testing being used for routine refinery control of motor fuel anti-knock quality were established some 30 years ago. Since that time, patterns of engine operation and gasoline performance have been altered due to many broad technical advances in both fuels and power plants. As a result, existing methods do not give a satisfactory simulation of actual operating conditions.

Today, maximum knock occurs at a higher average engine speed than years ago. Furthermore, the different chemical composition of the fuel, along with new anti-knock compounds, frequently produces patterns of anti-knock quality at different driving speeds than were anticipated when the present knock-test methods came into use. Many types of cars are highly sensitive to the newer fuel characteristics—for example the current designs coming out of Europe as well as American cars with manual transmissions.

One new method said to be more realistic than existing techniques was described by R. A. Hoffman of duPont during the SAE meeting. Termed "knock-count" rating method, the system filters out false signals from extra rapid combustion and measures only those pressure vibrations which result from gasoline knock.

The standard knock-testing method gives questionable results in many instances when applied to fuels of high aromatic content, especially at upper octane levels, Mr. Hoffman pointed out. Repeated tests often result in different octane numbers, and the aromatics tend to be rated lower than shown in actual road tests.

To overcome these difficulties, a new detection system was devised using an improved pick-up to sense cylinder pressure and new electronic circuitry properly tuned to the frequency of the pressure disturbances accompanying knock. With the new detection system, it was found that the occurrence of knock can be handled statistically, and from this was evolved an octane rating method based on the percentage of engine cycles during which knock occurs.

Tests on a number of fuels of varying hydrocarbon types and knock resistance in a single cylinder engine at standard knock rating conditions showed the following results:

(1) The new instrumentation gives octane ratings based upon knock, and these are not affected by the unusually high rates of pressure rise which, in the case of some fuels, accompany non-knocking combustion.

(2) Repeatability is largely independent of octane level, with successive tests giving virtually identical results for any given fuel.

(3) Sensitivity of the new system is the same at all octane levels—that is, the change in the per cent of engine cycles knocking remains the same for each unit change in octane rating.

Based on conventional reference fuel systems, octane numbers obtained by the new method are considerably higher for aromatic fuels, somewhat higher for olefins, and about the same for paraffins when compared with standard ASTM octane numbers, the du Pont man stated.

A somewhat different approach to the problem was suggested in another SAE meeting paper, by D. Frazier and H. F. Hostetler of Standard Oil Co. (Ohio), who agreed with other speakers that adjustment and standardization of the octane "yardstick" method for more accurate and more practical rating of modern gasolines is a necessity for today and tomorrow.

The final effective rating of a gasoline, so far as the user is concerned, is in his automobile engine on the road, the Sohio authors pointed out. Differences in octane ratings between laboratory and road—which cause confusion to everybody—can be reduced by controlling lean-rich standards in the laboratory knock engine to approximate more closely the leaner mixture in the engine of the car on the road.

Cars seem to rate fuels lean of the primary reference fuels rating, and hence if a rule is adopted of outlawing laboratory ratings rich from reference fuels, nothing of "road" importance should be missed, and a truer octane rating should be obtained.

Highly efficient removal of hydrogen sulfide and production of pure sulfur are two advantages claimed for the new British-developed Stretford Process, a liquid purification technique for such gases as refinery gas, natural gas, coal gas, and air.

Developed by the North Western Gas Board, in association with the Clayton Aniline Co. Ltd., the process is now available under licensing arrangements.

Among the specific advantages cited are:

(1) Hydrogen sulfide is virtually eliminated—below 0.1 ppm is readily achieved.

(2) Process is effective on all concentrations of hydrogen sulfide from the pure gas to traces only.

(3) Sulfur paste recovered by filtration contains approximately 40 to 50% of solution and has a purity of 97% or better on the dry basis, depending upon the nature of the original gas.

The Stretford process was reported briefly a few months ago (WORLD PETROLEUM, January, 1961, p. 10). Principle of operation is as follows:

The washing medium is an aqueous alkaline solution of a commercial intermediate containing salts of one or more of the anthraquinone disulfonic acids. Three stages are involved in the removal of hydrogen sulfide from gases:

(1) Removal of the H_2S from the gas stream by the alkaline washing medium.

(2) Reaction between the hydrosulfide ions formed in the washing stage with a carbonyl radical of the anthraquinone disulfonic acid, which gives sulfur and a reduced form of the reagent.

(3) Regeneration of the original anthraquinone disulfonic acid from the reduced form by air oxidation.

The initial removal of H_2S depends on the rate of absorption of the gas in the washing medium. For this purpose, a high pH is necessary, but this should not exceed 9.5 or the reaction in Stage 2 will not go to completion. In practice, a pH of 8.5 to 9.5 is used.

The reagent must be present in sufficient excess to ensure complete oxidation of the H_2S absorbed. A concentration of 0.2 to 0.5% is normally used, and the quantity of solution circulated is such that the anthraquinone disulfonic acid concentration is three or four times that of the equivalent hydrosulfide concentration.

The process can be applied to gases containing carbon dioxide. In low concentrations no special provisions are needed. In high concentrations, the process may be carried out at an elevated temperature, or a side stream of the solution may be taken off continuously and decarbonated.

What's New in Processing Plants

Amoco Australia, Ltd., a new refining and marketing subsidiary established by Standard Oil Co. (Indiana), with headquarters in Sydney, plans a refinery near Brisbane with an initial capacity of 15,000 b/d, with full range of products. Chief executive of the new firm is F. McKinley Blough, managing director. In-

corporated at the same time was Amoco Holdings Ltd., a holding company for Amoco Australia.

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Site of the new 40,000-b/d refinery being built in New Zealand by a group including Shell, British Petroleum, Caltex, and Mobil has now been disclosed as Marsden Point, in North Auckland. Forty per cent of the share capital of the refining company is to be offered to the New Zealand public.

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The Hungarian Oil Trust recently ordered a 20,000 b/d crude topping plant from French concerns. The unit will be designed and constructed by Soc. Francaise d'Engineering in cooperation with Soc. Controle et Application, Paris. Plant location was not disclosed.

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Australian Oil Refinery's proposed $29 million expansion at Kurnell, Botany Bay, N. S. W., has been rejected by the Cumberland County Council. Caltex, Ampol, and H. C. Sleigh Ltd. had applied for use of 200 acres of Crown land adjoining the existing plant, which the County Planner said is a reserve containing rare Australian plants extinct elsewhere in N. S. W.

Husky Oil Co.'s Cody, Wyoming, refinery has taken a new look with the near completion of a $7.5 million expansion project which included new catalytic cracking and alkylation units as well as a 96-mile products pipeline connecting the refinery with Billings, Mont.

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The government of Senegal has given approval for construction of a 40,000 b/d refinery, the country's first, in the Cap Vert region near Dakar. Three groups currently engaged in exploration will be concerned with the new project: Soc. Africaine des Petroles, in which the French Government has a controlling interest; Soc. des Petroles du Senegal, in which the BP group has a 50% interest; and Cie. des Petroles de l'Afrique Occidentale, a new affiliate of Cie. Francaise des Petroles.

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North Korea's first oil refinery, of 40,000 b/d capacity, is to be built by Russia under a technical assistance agreement. USSR will also supply crude

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Western Leaseholds, a subsidiary of Canadian Petrofina Ltd., plans a 40 mmcfd $6 million natural gas plant in the Wildcat Hills field near Calgary, Alta., with completion expected about November of this year. Products will include about 35 mmcfd of sales gas, 450 b/d of stabilized condensate, and 50 ton/day of sulfur.

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What's New in Petrochemicals

Goodrich-Gulf Chemicals Inc. expects to complete by the end of 1961 a new multi-million dollar plant at Institute, West Va., for the production of cis-polybutadiene rubber, trade-named "Ameripol CB," and with an initial output capacity of 20 million lb/yr.

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Chinese Petroleum Corp. and Mobil Chemical Co. have submitted a joint application to the government of the Republic of China for the construction of 100,000 ton-yr (metric) urea plant in Taiwan. It is expected that a Taiwan company will be formed within six months for erecting and operating this facility.

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Imperial Oil Ltd. has awarded the main construction contract for a 30 million gal/yr benzene plant at Sarnia, Ont., to Canadian Bechtel Ltd., with completion of the $5 million facility planned for this coming fall. The new unit will bring Imperial's petrochemical investment at Sarnia to more than $45 million. Part of its output will be used by Imperial in other manufacturing; the balance is committed under supply agreements to consumers in Canada and in the export market.

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Crown Central Petroleum Corp. has been granted a license by Houdry Process Corp. to build a 17 million gal/yr benzene plant, using a new catalytic dealkylation process named DETOL and developed by Houdry. The unit will be in operation by mid-1961. Engineering and construction is being handled by Catalytic Construction Co. This is the first license to be granted by Houdry for DETOL, which is a highly selective process producing close to theoretical yields of benzene when delkylating alkyl benzenes such as toluene and xylenes. The process converts non-aromatics and organic sulfur compounds to light hydrocarbons and hydrogen sulfide.

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Polymer Corp. (Sarnia, Ont.) has formed a French company, Polymer Corp. (SAF) in partnership with the Banque de Paris et des Pays-Bas, with a share capital of some £1.9 million, to build and operate a 10,000 ton/yr synthetic rubber plant on a 175-acre site at La Wantzenay, near Strasbourg. Estimated capital requirement for the plant is $12 million. It is expected to be in operation in the summer of 1962, and its output will not replace Sarnia production.

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Suntide Refining Co. has awarded a contract for the design, engineering, and construction of a 30 million lb/yr ethylbenzene plant to Badger Mfg. Co., to be built at Corpus Christi, Texas and completed by mid 1961. The new unit will be the fourth to be built using a process developed jointly by Badger and Cosden Petroleum Corp. in 1956. It recovers ethylbenzene from a mixed xylene stream in a single step.

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With the completion early this year of a conversion program, Shell Oil Co. will become one of the largest producers of benzene in the world, the company has reported. Total capacity of three units—at Wilmington, Calif., Houston, Tex., and Wood River, Ill.—will be more than 60 million gal/yr.

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Tennessee Gas Transmission Co. is reportedly planning a major petrochemical plant on its Houston Ship Channel property.

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Organsko Kemijska Industrija plans a $35 million petrochemical facility at Zagreb, Yugoslavia, with aid from the U. S. Development Loan Fund and other sources. Foster Wheeler Corp. is providing engineering and will supervise construction of six process units.

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AviSun Corp. and Shin Nippon Chisso Kiryo K.K., will construct a 30 million lb/yr polypropylene plant at an undisclosed site in Japan, with completion planned for early in 1962.

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Enjay Chemical Co. will expand the ethylene producing capacity of its Bayway, N. J., plant by 35%, bringing total output to 175 million lb/yr when the expanded facilities are completed in the second quarter of 1962, and raising the company's total ethylene producing capacity to 845 million lb/yr, of which 250 million lb/yr are consumed internally.

API Refiners Program Told

Technical discussions ranging from stream analyzers to the outlook for the fuel cell will highlight the 26th Midyear Meeting of the American Petroleum Institute's Division of Refining May 8-11 in Houston.

Other topics to be covered among the 30 papers at the Rice Hotel include automotive research, corrosion, pumps, compressors and turbines, operating practices, and processes. The annual dinner will be May 10, with A. P. Frame of Cities Service Co., the API's vice president for refining, presiding. More than 70 committee meetings are also scheduled for the program.

The paper on "The Fuel Cell: Its Promise and Problems," will be delivered by William J. Sweeney, vice president, Esso Research and Engineering Co., during the session on automotive research.

Two sessions on plant stream analyzers will cover a wide range of topics within this general subject. The session on operating practices will be devoted entirely to safety.

Two papers scheduled for the session on processes include "Production of High Boiling Normal Paraffins from Petroleum," by D. B. Broughton and A. G. Lickus of Universal Oil Products Co., and the "Gulf HDS Process," by authors with Gulf Oil Corp.

Fuel Cells Evaluated

Six types of fuel cells which have proved feasible as sources of electrical energy are evaluated in a new U.S. Air Force research report now available through the Office of Technical Services, Business and Defense Services Administration, U.S. Dept. of Commerce, Washington 25, D. C.

The report, "Fuel Cell Systems," PB 161 972, may be ordered from the above address, price 50 cents. It covers results of tests conducted on the following types of fuel cells: electrolyte, molten salt electrolyte, consumable electrode, ion-exchange electrolyte, chemical regenerative (redox), and thermal regenerative.

Written for the use of technologists without a background in fuel cells as well as for specialists in the field, the report defines a fuel cell as a D-C generator which produces energy directly from the chemical reaction between an oxidant and a fuel that are continuously injected. The report points out that a fuel cell differs from a battery in that its electrodes are inert.

Gulf Moves Laboratories

Gulf Oil Corp. is moving its refinery technology laboratory at Girard Point (near Philadelphia) to its main technical center at Harmarville, Penna. (near Pittsburgh).

The transfer will take approximately 200 employes to the Pittsburgh area. Some 57 more will remain in Philadelphia and be transferred to the refinery.

UOP Process Models on Display

Universal Oil Products Co. has presented models of its Platforming and Polymerization processes to the Smithsonian Institution in Washington, D. C., for display in the new Hall of Petroleum.

The two models are made of solid brass and each is about 3 by 5 ft. in size. Illuminated flow charts, controlled electrically to illustrate the process flow, portray the operations visually in each process.

Presentation was made by UOP chairman and president, M. P. Venema, who pointed out that his company was responsible for the development and practical commercialization of the continuous cracking method, the Dubbs Thermal Cracking Process, and that "today, the company has more than 23 major processes, many of which are used throughout the world for the production of high octane gasoline, jet fuels, heating oils, diesel fuel, and petrochemicals vital in the manufacture of thousands of products."

The Hall of Petroleum, now being prepared, will eventually be housed in the Smithsonian's new Museum of History and Technology.

Celanese Has New Process

Celanese Corp. of America has announced that it is the first USA company to make petrochemicals by a new European process. It has licensed the process—a new route for the economical manufacture of acetyls—from Aldehyd GmbH, jointly owned by Farbwerke Hoechst and Wacker Chemie.

The new process will be used at a multi-million-dollar plant to be built on a 1,000-acre site near Bay City, Texas. Construction will start soon and the plant will be completed within a year. Celanese now makes 30 different derivatives of the acetyl family, with annual production exceeding 500 million lbs.

The process involves the catalytic oxidation of ethylene gas, and the principal product at Bay City will be acetaldehyde, starting point for many other acetyl chemicals. Production from the new plant will back up current acetaldehyde output by other processes at Celanese plants in Bishop and Pampa, Texas.

Initial facilities at Bay City will also include units for making of 2-ethyl-hexanol, which is used in the manufacture of such materials as vinyl resins, synthetic jet lubricants, and 2-ethyl hexyl acrylate.

OIL COMPANY STAFF CHANGES

D. L. Hussey

H. S. McCray

DANIEL L. HUSSEY, deputy manager of the Cologne, Germany, Esso refinery for 2½ years, has been named government relations representative for New Jersey by Esso Standard, a division of Humble Oil & Refining Co.

Hussey headed the team of experts from several countries which returned the huge Abadan refinery in Iran to production in 1954-55, and later became general manager at Abadan and a director of Iranian Oil Refining Co.

Before going to Iran, Mr. Hussey was general superintendent of the Bayway refinery. Returning to Bayway in 1955, he was named assistant general manager of East Coast manufacturing operations.

DR. GILBERT B. CARPENTER, retained by Mobil Chemical Co. as technical adviser, will have his headquarters at Mobil Oil Nederland N.V., Stadhuisplein 30, Rotterdam, Holland. He will advise Mobil Chemical on the expansion of its chemicals production and research activities in the USA and abroad.

LELAND C. BURROUGHS, loaned by Shell Oil Co. to the American Petroleum Institute for a two-year assignment, has been assistant to Shell's manufacturing vice president since 1946. He will serve the API as consultant on abatement of air and water pollution and as executive secretary of the API Smoke and Fumes Committee.

ROYCE A. COFFIN, elected treasurer, of Helmerich & Payne, Inc., Tulsa, had been assistant to the financial vice president.

RONALD D. NELSON has been appointed assistant to the senior vice president of Texaco Inc. He has been manager of Texaco (Trinidad) Ltd. and Texaco Antilles Ltd., with headquarters in Trinidad.

JAY S. HANDLEY to vice president in charge of drilling, production, and production engineering for Texas Gas Exploration Corp.

HOWARD I. ARMSTRONG to director of marketing of Mobay Chemical Co. of Pittsburgh, after serving as director of sales planning of Monsanto Chemical Co.'s organic chemicals division at St. Louis.

EDWIN M. HAUN to area development manager for the Asia-Pacific area of Monsanto Chemical Co.'s overseas division at St. Louis, and **JAMES R. MOORE,** area development manager for Canada and for projects without geographical limits, and **ROBERT J. SIMON** area development manager for Europe after serving in the same capacity for the Asia-Pacific area.

JOHN W. TIMMINS of Dallas, special counsel on foreign operations to Sun Oil Co.'s production department since 1956, has retired, bringing to a close a long career as a Sun attorney for over 41 years. In all, Timmins made some 37 foreign trips, visiting over 27 countries. He traveled by airplane in excess of 275,000 miles.

PAUL N. TEMPLE has been elected president of Esso Iberia, Inc., Spanish exploration affiliate of Standard Oil Co. (N. J.) and of Esso Standard Espanola, S.A., Jersey's marketing affiliate in Spain. Temple had been assistant manager of the negotiations division of Jersey's Producing Coordination Department. He has traveled extensively abroad in the course of his work, especially in Libya, Turkey, Guatemala, The Netherlands and Denmark.

HOWARD S. McCRAY has been elected president of The Texas Pipe Line Co., succeeding John W. Emison, who will retire April 1, 1961 after 41 years' service. Mr. McCray, assistant to the president of Texaco Inc. for the past two years, joined Texaco in 1926 as an engineer at Port Arthur, Tex. He was named manager of the refining department's operations division in 1954, and manager of the purchasing department one year later.

LOUIS F. DAVIS became assistant general manager of The Atlantic Refining Co.'s domestic producing department on February 1, and will advance to general manager upon the retirement of Edgar Kraus in late May.

E. RAY LAUGHNER has been named director of the management engineering department for Ashland Oil & Refining Co. **GAYLE J. WELLS** succeeds him as general superintendent of crude oil pipelines. **ROBERT W. EXLINE** was made assistant manager of the crude oil supply and pipeline department.

Dr. HANS SCHINDLER has been appointed a vice president of Sonneborn Chemical and Refining Corp., a wholly owned subsidiary of Witco Chemical Co., Inc.

WILLIAM M. CARTER has been elected vice president and general manager of Valvoline Oil Co.'s foreign division. **BEN H. MORRIS,** formerly general manager of the foreign division, continues as a vice president and consultant. Mr. Carter will supervise export sales from the division's offices in New York City and maintain liaison with foreign distributors.

ARTHUR B. HERSBERGER has been appointed general manager of marketing for Atlantic Refining Co. He will report to Dwight T. Colley, vice president, who will retire on May 1 after more than 40 years of service with the company. **MILTON G. DAVIS** becomes general manager of domestic marketing, reporting to Dr. Hersberger.

Dr. Hersberger moves to his new assignment from the post of general manager of foreign marketing and manager of special sales.

CHARLES F. SCOTT from marine coordinator of Standard-Vacuum Oil Co. to general manager of the marine transportation department of Socony Mobil Oil Co., Inc. succeeding **PARKER S. WISE,** who will be special assistant to the general manager.

E. C. SLAGHT, Jr. to vice president and technical director of Newport Industries Division, Heydon Newport Chemical Corp.

Dr. T. J. O'DONNELL, formerly director, geophysical research division, has been named associate director of research at Gulf Research & Development Co., Harmarville, Pa.

S. H. McMANUS, comptroller, and a 40-year veteran of the Sinclair organization, has been elected a vice president of Sinclair Oil Corp. McManus began his career with Sinclair in 1920 in the auditing department.

W. DOW HAMM has been elected a director of Atlantic Refining Co., to succeed L. A. Sunkel, who is retiring after 42 years of service. Named a vice president and general manager of the crude oil production department on March 15, 1960, Hamm was previously manager of domestic and foreign exploration.

P. N. Temple

W. D. Hamm

I. G. Davis

J. E. Bounds

I. G. DAVIS and **J. E. BOUNDS** have been elected executive vice presidents of Gulf Oil Corp., and **B. R. DORSEY** has been elected senior vice president.

Davis, formerly a senior vice president, is a member of the company's executive. Bounds, previously administrative vice president and coordinator-financial department, will be a new member of the executive. Dorsey, previously administrative vice president and coordinator-manufacturing department, will have as his primary responsibility, the general areas of refining, petrochemicals, product supply and product transportation on a world-wide basis. All three will continue in the general headquarters in Pittsburgh.

Davis was employed by Gulf Research & Development Co. in 1934 as a geophysicist and assigned to Venezuela. He was elected a Mene Grande vice president in 1950, and was elevated to its presidency in 1956. He returned to the USA as administrative vice president of Gulf in 1958 and elected a senior vice president in 1959.

Bounds joined Gulf at Tulsa in 1929. He subsequently served in various accounting capacities and he was transferred to Pittsburgh in 1955 and in 1958, he was elected an administrative vice president and coordinator, financial department.

B. R. Dorsey

Dorsey joined Gulf at its Port Arthur Refinery as a junior engineer and in 1948 was transferred to Puerta la Cruz, Venezuela, as manager of Venezuela Gulf Refining Co. He was transferred to Pittsburgh in 1955 and in 1956, he was promoted to coordinator, manufacturing department, his position at the time of his election to administrative vice president in 1958.

J. HOWARD MARSHALL has resigned as executive president of Signal Oil and Gas Co., to become president of Union Texas Natural Gas Corp.

Marshall has been a director and vice president of Signal since 1952, having been named executive vice president in August, 1959. For nine years prior to his joining Signal he was president and director of Ashland Oil and Refining Co., and previously served as chief counsel and assistant deputy of the Petroleum Administration for War from 1941 to 1944.

He succeeds Richard T. Lyons, who has retired but will continue as a director and member of the Executive Committee of Union Texas.

ROBERT R. CHASE to assistant to the senior vice president, Texaco Inc. With Texaco's refining department at New York since 1941, he has served on special assignment with the refining department at Houston, Texas, since April, 1960, following numerous supervisory positions at several refineries.

Esso Export Corp., international marketing affiliate of Standard Oil Co. (New Jersey), has announced a number of personnel changes and assignments.

P. L. RICHARDS, formerly manager of the sales division, chemical department, has been made assistant general manager, cargo sales department. Succeeding Richards is **E. F. H. PENNEKAMP,** who has been director of the Enjay Laboratories of Esso Research & Engineering Co.

R. C. KIDDOO, formerly manager, foreign sales division, cargo sales department, has been named

manager, planning division, supply and traffic department. Succeeding Kiddoo is **R. H. BERESFORD**, who has been senior sales representative, eastern hemisphere section, cargo sales department.

A. J. KELLY, who has been acting manager, planning division, supply and traffic department, has left for London to take up new duties as Eastern Hemisphere advisor, supply and traffic.

ARNOLD F. KAULAKIS has been elected a vice president, director, and executive committee member of Esso Research and Engineering Co. with responsibility for the engineering operations. He has been serving since last March as acting general manager of engineering.

J. HAROLD PERRINE to director of industrial relations, Sun Oil Co., succeeding William E. Zimmerman, who has retired last month after nearly a quarter of a century with the company. Succeeding Mr. Perrine as assistant director is **JOHN H. ASHENFELTER**, now an assistant to the director.

I. E. KILLIAN to sales manager at New York headquarters by Esso Standard, eastern region of Humble Oil & Refining Co., a new post. **ADEN P. WILLIAMS, Jr.**, has succeeded Killian as manager of Esso's New England marketing division, with headquarters in Boston.

SAMUEL E. CHARLTON to assistant manager of the Oklahoma-Pate Area of Humble Oil & Refining Co. from Esso Standard, eastern region of Humble.

ROBERT N. SIMONSEN, consultant-waste disposal and air pollution for Standard Oil Co. (Ohio), has been named chairman of the Oil Refining Industry Action Committee of the Ohio River Valley Water Sanitation Commission.

WILLIAM L. NAYLOR has retired as a senior vice president of Gulf Oil Corp., after more than 40 years with the company. He joined Gulf in its crude oil purchasing department in 1920 and went to Mexico in 1923 for the Mexican Gulf Oil Co., at Tampico. Naylor came to Pittsburgh in 1928 as a member of the comptroller's staff and was elected comptroller in 1948. He was elected senior vice president in 1955, becoming a member of the management committee.

THOMAS P. SIMPSON, general manager of engineering and operations analysis for Socony Mobil Oil Co., Inc., has retired after 35 years of service. He was one of the developers of the Thermofor catalytic cracking process.

DALLAS T. PINCKNEY, now a consultant, at 15 Arlington Court, Berkeley, Calif., has retired as manager of operations for the Trans-Arabian Pipe Line Co. in Beirut, Lebanon, after a distinguished, 42-year petroleum career that stretches from the Yukon to the Persian Gulf.

NORTON H. WALTON has been appointed assistant operating superintendent in charge of SunOlin Chemical Co.'s urea plant at Claymont, Del.

S. A. GUIBERSON, JR.

S. A. Guiberson, Jr., 87, co-inventor of the rotary tool joint which made modern oilwell drilling possible, and early pioneer in Texas and California oilfields, died in Pasadena, Calif., after a long illness.

Guiberson began his career in an oilfield adjacent to the old Ventura county ranch of the Guiberson family. In 1904, he supervised the first major pipeline constructed in California and in 1912 began working in the development of oilfield tools for drilling and production. Together with Max Whittier he invented a rotary tool joint and founded the Guiberson Corp. in Dallas.

During Warld War I, he was appointed by the President to serve as director of Pipelines.

Before World War II, Mr. Guiberson became interested in the development of diesel engines for aircraft and tanks. During the war, he organized the Guiberson Diesel Engine Co., which manufactured several thousand Guiberson radial-diesel engines for the Army Ordnance Department. These were used both by the Army and the Marine Corps in tanks and in LVT's, and were the power source for the first tank landings at Guadalcanal.

Wages Boost Prices

Wage boosts for oil workers in the USA probably will show up in higher product prices. The pattern which is fast shaping up in labor contracts (set by Sinclair's settlement of a 14¢ hourly boost) calls for wage increases averaging about 5%. Refiners say they will have to get ¼¢ per gallon on gasoline or ½¢ on fuel oil to offset the 5% boost. Gulf Oil Corp. estimates the 5% increase for all its hourly employees below the supervisory level will add about $10 million to the company's annual payroll costs and "must ultimately be paid for by consumers through higher product prices." Sun's president Supplee notes the 5% boost will raise his company's payroll by $5 million annually; he doubts this can be recovered fully by higher product prices. The 5% wage boost which Continental Oil has spread to its non-union hourly workers and salaried employees will add $4 million yearly to the company's costs, says president McCollum. "Conoco has no choice but to attempt to recover this added cost by increasing the price of its products."

Subsea Completion Technique

A new technique for producing offshore wells has been developed by the exploration and production research division of Shell Development Co., Houston. The new technique makes it possible to place equipment for controlling the flow of crude oil and gas on the bottom of the sea over the completed well. Operations involved in bringing in the well and subsequent production operations are all performed by remote control from the surface without the use of divers.

The first such well to be completed is located under 56 ft of water in the West Cameron Bicok 192 field, 35 miles off the coast of Louisiana. Details of the new method have not been revealed.

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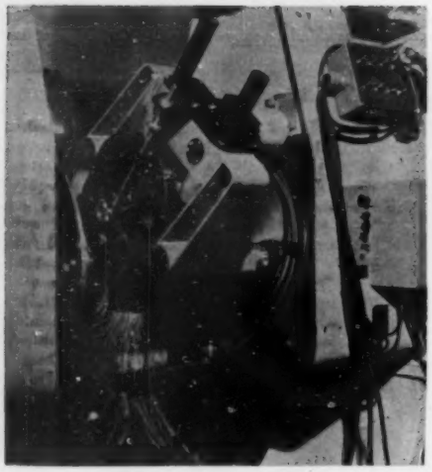


Automatic Pipeline Welder

A new process for automatic pipeline welding in the field has been developed through Esso Research and Engineering Co. Key to the process is a welding device that clamps over and welds two lengths of pipe twenty times faster than possible with present hand welding techniques. M. J. Dabney, head of Esso Research's pipeline research program characterizes the automatic pipeline welder as "perhaps the fastest and most practical field pipe welding device in the world." Only three men are needed in the new process—a welding technician, his assistant, and a tractor driver.

The welder, which has undergone a six-month evaluation and a successful field test in the Odessa oil fields of West Texas, is designed for use with four, six, and eight-inch diameter pipes. The entire process, however, can be easily adapted for even massive 30-inch and larger diameter piping.

Cooperating in the research on the new process were the Battelle Memorial Institute of Columbus, Ohio, and the Air Reduction Sales Co. of Union, New Jersey, which designed and built the prototype automatic welder. Crutcher-Rolfs-Cummings Co. of Houston, also participated in the development work.

These are the basic steps in the new process:

Steel pipe is strung along the ditch in which it is to be buried. The tractor aids in lifting pipe to be welded and in placing the automatic welder over the pipe ends. The ends are held firmly together and in line by means of a specially devised Crutcher-Rolfs-Cummings internal alignment clamp inserted in each pipe. After the weld is completed, the clamp is collapsed and withdrawn to the next joint.

On eight-inch pipe the weld is completed in one minute and is as strong as manual welds requiring up to twenty minutes.

Jersey sees the process as having possibilities in other fields. "Ship-builders and storage tank manufacturers may find it adaptable to their specific needs," he says.

Opens London Office

• Turner G. Garwood has been promoted to manager, eastern hemisphere for Otis Engineering Corp., Dallas, and has established headquarters for the oil industry production equipment and service company at 23-25 Maddox St., London W-1, England. For the past two years he has been Otis' European representative at Geneva. Prior to his assignment to Geneva, he was in charge of European export sales in Otis' general offices in Dallas.

Package Compressors

New illustrated Bulletin 203, issued by Clark Bros. Co., division of Dresser Industries, Inc. Olean, N. Y., introduces the Clark C-Line of packaged air compressors for industrial applications. The line includes four models rated at 25, 50, 75 and 100 hp respectively.

Treating Process Brochure

Petreco division of Petrolite Corp. has published a new brochure describing Petreco Electrofining processes and the Bender catalytic sweetening process. Copies are available from Petreco division of Petrolite Corp., 3202 South Wayside Drive, Houston 1, Texas, or Petroleum Rectifying Co. of California, 1390 E. Burnett, Long Beach 7, Calif.

Williams Names Two

Williams Brothers Co., Tulsa, has elected Edwin M. Hubach and P. D. Campbell as vice president. Hubach will be responsible for domestic and Canadian construction operations. Formerly he was in charge of Williams Brothers operations in Venezuela. Campbell is in charge of Williams Brothers operations in Europe, Africa, the Middle East and Far East. He will make his headquarters in London.

Heads Mexican Operations

J. M. (Pepe) Estrop, who has had 40 years' experience in the oil industry in Mexico, has been named exclusive representative for Gardner-Denver Co. in Mexico. His headquarters will be at Amsterdam 271, Mexico, D. F.

Estrop has served as manager of Cia. Pan Americana Comercial, S. A., a machinery firm; material agent for Petroleos Mexicanos; and material superintendent for Cia. Mexicana de Petroleo-El Aguila, among others.

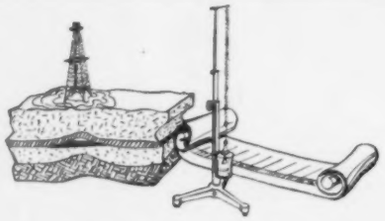
A view of Cameron Iron Works' new 20,000-ton forging press, showing control panel. Substantial advances in oil and atomic fabrication are expected from this new press.

Prevents Phillips Control

Union Oil Co. of California filed suit against Phillips Petroleum Co. to prevent Phillips from exercising "any control, direct or indirect, over our company." The complaint requested the court to enjoin Phillips from voting Union shares it holds, to prevent it from acquiring additional Union shares, and to force Phillips to get rid of its current Union holdings. Union Oil asked the same injunctions sought recently by federal trustbusters.

Plan Petrochemical Plants

Three petrochemical plants costing $17.5 million are being planned for erection near the Haifa, Israel, refinery. Foreign and Israeli investors and the government are said to be collaborating.



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Review of Recent USA Patents

(*Continued from page 69*)

30-45% magnesia, 10-35% iron oxide, 3-6% chromia and 30-40% potassium carbonate is claimed for olefin dehydrogenation in Phillips Petroleum Co.'s 2,950,258 (E. W. Pitzer and L. Bagnetto). A method for regeneration of a chromia-alumina butadiene catalyst, in which the temperature of the oxygen containing gas is maintained above 1000F. is described by B. Busch-Petersen, J. J. Cicalese and R. G. Craig in 2,915,570 (to Houdry Process Corp.). (See accompanying diagram, Fig. 2.)

CATALYST SUPPORTS

Patents for methods of manufacturing alumina or silica catalyst supports have issued in great numbers over the years. There seems to have been a drop in the number of new patents recently, testifying to the well covered nature of the field.

G. R. Gilbert (2,917,365 to Esso Res. & Eng. Co.) prepares beta-alumina trihydrate and thus eta-alumina from aluminum alcoholate by a special seeding technique. R. C. Hansford in Union Oil Co.'s 2,917,366 makes high surface area alumina by hydrolysing an aluminum polyester of a polyhydric alcohol. An arrangement of intimately and continuously contacting an aluminum salt solution and ammonia is disclosed in 2,932,-620 (W. von Fuener, W. Oettinger, O. Reitz and E. Lorenz to Badische Anilin and Soda Fabrik). Precipitated alumina is immediately removed from the reactants. H. M. Brennan and E. Field (2,925,394 to Standard Oil Co., Ind.) propose a method of extruding high purity, calcined alumina of 1-18% water content by incorporating 0.2-1.1 vol-% of aqueous ammonia solution of pH 8-12 into the mass.

The use of colloidal silica in catalyst manufacture is discussed in The Atlantic Refining Co.'s 2,941,958 (J. E. Connor and C. S. Shipley). END

Kerr-McGee Merges

Stockholders of Kerr-McGee Oil Industries, Inc. and Pacific Uranium Mines Co. have approved an agreement providing for the merger of Pacific into Kerr-McGee. The agreement calls for issuing one share of Kerr-McGee common stock for each 20 shares of Pacific Uranium and provides the stockholders a method for disposing or consolidating fractional interest. A total of 220,537 shares of Kerr-McGee stock is to be issued for Pacific Uranium's 4,410,750 shares.

Kerr-McGee will acquire through the merger an additional 20.81% of the stock of Kermac Nuclear Fuels Corp., increasing its interest to approximately 79% of the stock of this company. In addition, Kerr-McGee acquires Pacific's interest in certain uranium mining properties and royalties in the Ambrosia Lake area near Grants, New Mexico, plus 25% of the stock of Ambrosia Lake Uranium Corp., which owns substantial uranium reserves in the vicinity of the Kermac mill. Kerr-McGee has also contracted with the owners for the acquisition of the remaining 21% of Kermac Nuclear stock in exchange for common stock of Kerr-McGee. On completion of these transactions, Kermac Nuclear will become wholly-owned by Kerr-McGee.

Kermac Nuclear holds some 20% of all known US uranium reserves and owns and operates the nation's largest uranium processing plant which is located in the Ambrosia Lake area.

Guiberson Appointment

Robert L. Boyd has been appointed executive vice president and general manager of Guiberson Corp., to succeed Alex Smith, resigned.

The Guiberson Corp. manufactures and sells workover and production tools throughout the petroleum industry. Guiberson officers now are: J. B. O'Connor, chairman of the Board; Gordon G. Guiberson, president; Robert L. Boyd, executive vice president and general manager; R. E. Reimer, vice president; A. J. Wallis, secretary; C. H. Ballard, treasurer; T. V. Terry, assistant secretary and assistant treasurer; J. D. Mayson, assistant secretary and assistant treasurer.

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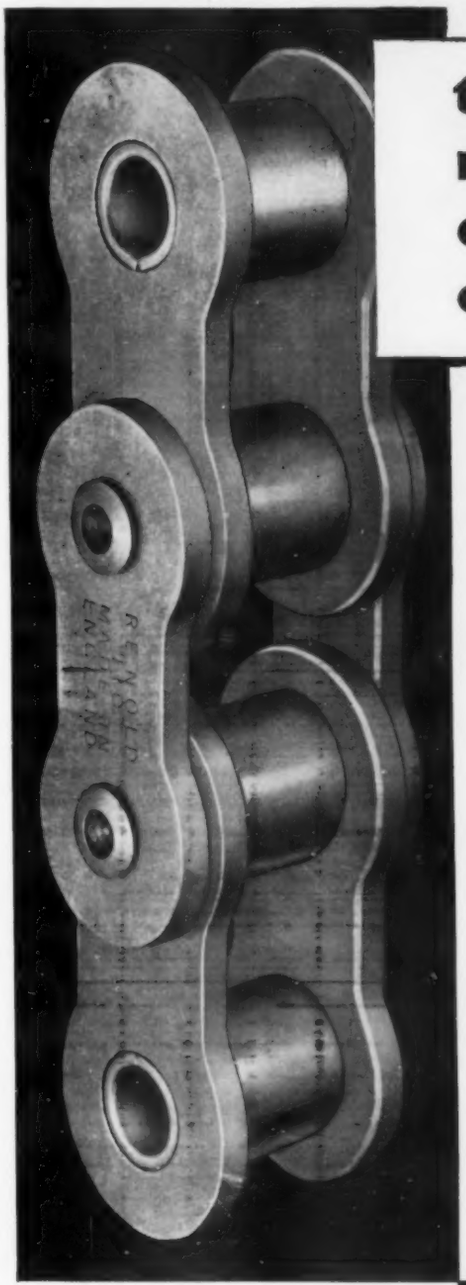

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World Petroleum Statistics

FREE WORLD SUPPLY AND DEMAND, CRUDE AND PRODUCTS, JUNE 1960

(Thousands of barrels)

Source: USA Bureau of Mines, Division of Petroleum

Country	CRUDE PETROLEUM					REFINED PRODUCTS			
	Production	Imports	Exports and reexports	Stock change, other demand, and loss	Total 1/ refinery input / Total 2/ refinery output	Imports	Exports and reexports	Domestic demand (incl. bunkers) 3/	Bunkers-all flags (as reported)
NORTH AMERICA									
Canada	14,693	7,826	4,369	-2,249	20,583	851	196	4/21,761	
Mexico	7,546	-	-	-456	8,574	588	224	8,938	
United States (incl. Alaska and Hawaii)	211,132	33,877	270	+5,930	251,687	24,614	6,477	4/276,431	7,001
Subtotal	233,371	41,703	4,639	+3,225	280,844	26,053	6,897	307,130	
CENTRAL AMERICA AND CARIBBEAN									
Costa Rica	-	-	-	-	-	E/ 98	-	98	
Cuba	9	E/2,000	-	-484	E/2,493	E/189	-	2,682	
Dominican Republic	-	-	-	-	-	E/217	-	217	
El Salvador	-	-	-	-	-	E/123	-	123	
Guatemala	-	-	-	-	-	E/276	-	276	
Haiti	-	-	-	-	-	E/ 72	-	72	
Jamaica	-	-	-	-	-	390	-	390	E/ 98
Nicaragua	-	-	-	-	-	E/127	-	127	
Panama, Canal Zone	-	-	-	-	-	886	175	711	424
Panama, Republic	-	-	-	-	-	E/214	-	214	
Puerto Rico	-	1,846	-	-346	2,342	450	867	1,925	
Subtotal	9	3,846	-	-830	4,835	3,040	1,042	6,833	
SOUTH AMERICA									
Argentina	4,690	2,036	-	-69	6,795	743	7	4/7,170	116
Bolivia	237	-	89	+3	145	9	3	151	
Brazil	2,309	3,207	478	-389	5,427	E/4,008	E/ 85	9,410	
Chile	572	166	-	-40	780	E/583	-	1,363	
Colombia	4,737	-	2,757	-162	2,207	E/ 26	316	4/1,565	E/115
Ecuador	225	E/138	-	-	363	13	-	376	
Netherlands Antilles	-	E/19,979	-	+753	20,046	E/1,325	E/16,416	4/4,955	
Paraguay	-	-	-	-	-	E/ 61	-	61	
Peru	1,545	-	244	-20	1,321	288	433	1,176	31
Trinidad	3,573	4,613	437	+915	6,837	E/265	E/5,799	4/1,323	1,069
Uruguay	-	651	-	-150	E/801	117	-	918	E/ 78
Venezuela	81,474	-	E/58,627	-76	23,085	E/ 71	18,832	4/4,324	E/1,591
Subtotal	99,362	30,790	62,632	+765	67,807	7,329	41,831	32,792	
WESTERN EUROPE									
Austria	1,405	394	577	+85	1,157	727	49	4/1,531	
Belgium and Luxembourg	-	3,641	-	-549	4,210	2,051	1,473	4,788	266
Denmark	-	-	-	-19	E/ 19	2,629	7	2,641	132
Finland	-	703	-	+53	E/650	654	-	1,304	
France	1,137	19,567	-	+2,543	18,177	1,542	3,865	4/16,415	916
Germany, West	3,312	11,018	-	-694	14,984	5,013	983	19,074	352
Greece	-	1,092	-	+354	738	408	-	1,146	
Iceland	-	-	-	-	-	423	-	423	
Ireland	-	968	-	+837	131	196	-	927	40
Italy	901	17,204	419	+104	18,798	984	4,186	4/11,591	1,790
Netherlands	1,044	10,293	-	+1,529	10,456	3,050	6,177	7,329	560
Norway	-	46	-	+46	-	2,282	-	2,282	E/175
Portugal	-	577	-	-114	691	291	273	709	
Spain	-	2,756	-	+157	2,681	137	840	2,576	E/154
Sweden	-	2,026	-	+484	1,542	4,070	79	5,533	E/247
Switzerland	-	-	-	-	-	1,703	-	1,703	
United Kingdom	53	26,723	-	+2,896	23,880	9,214	4,368	4/28,136	2,458
Yugoslavia	345	301	-	-33	679	E/ 88	E/ 32	735	
Subtotal	8,197	97,309	996	+7,179	99,387	35,402	21,614	108,843	
MIDDLE EAST									
Aden	-	1,015	-	-86	1,101	1,962	374	2/2,689	E/2,192
Bahrain	1,351	4,430	-	+38	5,743	86	5,273	2/668	316
Iran	29,453	-	18,223	-94	E/11,324	-	7,462	3,862	E/471
Iraq	27,808	-	E/27,316	-738	E/1,230	9	-	1,232	
Israel	70	E/838	-	-	908	E/898	-	1,806	E/ 31
Jordan	-	-	-	-	-	E/ 96	-	96	
Kuwait	43,779	-	41,655	-3,186	5,310	2	2,301	2/3,011	2,091
Lebanon	1	E/434	1	-	E/434	E/ 28	-	462	E/ 67
Neutral Zone	3,941	-	E/2,941	-	E/1,000	-	E/490	2/510	E/200
Qatar	5,093	-	E/5,075	-	E/ 18	-	-	18	
Saudi Arabia	36,317	-	28,596	+957	6,764	2	5,191	1,808	E/1,060
Turkey	207	-	-	+47	160	595	-	755	
U.A.R., Syria	-	E/457	-	-	E/457	18	-	475	
Subtotal	148,019	7,174	123,806	-3,062	34,449	3,689	21,091	17,382	
AFRICA									
Algeria	3,950	-	3,442	+508	-	1,001	-	4/850	
Angola	37	-	-	-73	110	71	-	181	E/ 6
Republic of the Congo (Belgian Congo)	-	-	-	-	-	E/296	-	296	
Canary Islands	-	1,512	-	-123	2,256	220	1,244	5/1,232	469
Ethiopia	-	-	-	-	-	E/ 57	-	57	
States formerly in French Equatorial Africa	461	-	532	-71	-	E/178	-	178	
States formerly in French West Africa	-	-	-	-	-	E/341	-	341	
Ghana	-	-	-	-	-	216	-	216	
Kenya	-	-	-	-	-	E/503	92	411	E/ 76
Liberia	-	-	-	-	-	E/ 32	-	32	E/ 3
Malagasy Republic	-	-	-	-	-	58	-	58	
Morocco	61	E/ 74	-	-	135	538	-	4/510	E/ 40
Nigeria	479	-	584	-105	-	370	-	370	
Federation of Rhodesia and Nyasaland	-	-	-	-	-	E/331	-	331	
The Sudan	-	-	-	-	-	423	-	423	
Tanganyika	-	-	-	-	-	E/ 44	26	18	
Tunisia	-	-	-	-	-	304	-	4/266	
Uganda	-	-	-	-	-	E/116	14	102	
Union of South Africa	-	575	-	-27	608	1,565	170	1,397	
U.A.R., Egypt	1,869	E/1,000	127	+388	2,354	E/596	E/123	2,827	E/189
Subtotal	6,857	3,161	4,685	+497	5,457	7,240	1,669	10,696	
SOUTH ASIA, FAR EAST, AND OCEANIA									
Australia	-	6,964	-	+305	6,868	989	1,004	6,793	E/632
British Borneo	2,859	-	1,407	-	E/1,452	E/ 77	E/1,261	268	77
Burma	290	-	-	-27	317	15	4	328	
Ceylon	-	-	-	-	-	377	-	377	237
India	255	E/1,391	-	-	E/3,646	E/1,855	E/192	5,309	E/230
Indonesia	12,828	E/708	6,575	+287	E/7,061	E/271	4,473	2,571	188
Japan	274	12,809	-	-2,808	16,336	3,246	302	19,280	
Korea, South	-	-	-	-	-	E/373	-	373	
Malaya and Singapore	-	249	173	476	-	2,943	1,569	1,374	1,046
Netherlands New Guinea	130	-	E/130	-	-	-	-	Insig.	
New Caledonia	-	-	-	-	-	E/ 34	-	34	
New Zealand	-	-	-	-	-	827	-	827	E/130
Pakistan	177	-	-	-25	E/202	E/1,141	E/ 21	1,322	
Philippines	-	721	-	-70	791	E/859	-	1,650	
Taiwan	1	553	-	-23	577	15	7	585	
Thailand	-	-	-	-	-	900	-	900	24
Vietnam, South (incl. Cambodia)	-	-	-	-	-	E/461	-	461	E/ 3
Subtotal	16,814	25,395	8,285	-2,285	37,250	14,323	8,833	42,452	
WORLD TOTAL EXCLUDING EASTERN EUROPE, U.S.S.R., & MAINLAND CHINA	512,629	209,378	205,043	+5,489	530,029	97,296	102,977	526,128	

E/ Estimated based on latest available data.
1/ Total input includes crude runs to stills plus runs of other unfinished oils, topped crude and natural gas liquids blended.
2/ Total output includes refined product output plus refinery fuel and loss; excludes liquefied petroleum gases sold directly for fuel and chemical uses from natural gasoline plants.
3/ Unless otherwise specified, data represent apparent domestic demand (including inland demand, refinery fuel and loss, and bunkers). Apparent domestic demand is derived from the components of refined product output, plus imports, minus exports, with no allowance for changes in stocks.
4/ Domestic demand as reported, including refinery fuel and loss, stock changes, and bunkers; also includes, where available, liquefied petroleum gases sold directly for fuel and chemical uses from natural gasoline plants.
5/ Apparent domestic demand is heavily influenced by refinery fuel and loss, and bunker loadings.

W. H. Siems

Hughes Elects Siems

W. H. Siems has been elected to the board of directors of Hughes Tool Co. and Raymond M. Holliday has been secretary, following the retirement of Chester S. Johnson, vice president, director and secretary.

As vice president-sales, Siems directs the worldwide sales activities of Hughes and its subsidiaries. With the company for 35 years, he directed the company's export sales with headquarters in New York for 25 years. He was transferred to Houston in 1949 to become general manager, and was promoted to vice president-sales in October, 1959.

Emergency Shut-Off Valve

A new surface controlled annulus valve for emergency shut-off on dual completions has been engineered by Page Oil Tool, Inc., Long Beach, Calif. The valve has been designed for use where the casing annulus is employed as a flow conductor and can be installed in tubing 200 ft below the well head. Tubing can be extended ⅛-inch above the surface for pressuring the valve open. Slips can be set by pressuring the tubing string at the surface, enabling the packer element to be appropriately loaded.

Two Merged with Armco

Armco Steel Corp. has announced that two wholly owned subsidiaries, the National Supply Co. and Union Wire Rope Corp., have been merged with Armco. National Supply will be operated as the National Supply Division of Armco. Likewise, Union Wire Rope will be operated as a separate unit of Armco.

Sidney A. Shuman has been elected vice president and general manager, National Supply Division succeeding A. W. McKinney, who recently retired as head of National Supply.

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NEW PUBLICATIONS

Mannesmann Pipe In Oil-Field Service, Volume I, (72 pages). Volume II, *Useful Information For Oil-Field Experts* (74 pages). Profusely illustrated with photographs, diagrams, and charts. Half cloth, in cloth slipcase. Available from Mannesmann AG, Dusseldorf, Germany (Publication No. 2366 .E). No charge. This new handbook, based on the German edition Mannesmannrohre für Das Ölfeld, 1953, has been designed to meet the needs of international users. Comprehensive tables and illustrations are contained. For reasons of convenience, the book has been split into two self-contained volumes.

Volume I is devoted to basic general information, starts with sketch of the importance of Mannesmann pipe in the oil industry. A special chapter covers the various processes for manufacturing seamless and electrically welded steel pipe. The following chapter, Pipe Materials, deals with the use of ordinary carbon steels and high-grade special steels, approved only after extensive testing by the American Petroleum Institute (API). A summary of all the steels used for oil-country goods follows.

Volume II of the set is designed for practical use in the oil fields. It consists largely of readable tables and charts, giving information essential for the field. Shown are critical external pressures, resistance to internal pressure, etc. Finally, Volume II gives valuable data on the telescoping of oil-field pipe, whether casings, tubings, or drill pipe.

Secondary Recovery Publications

The Interstate Commerce Commission, Oklahoma City, 5, has published two new reports dealing with secondary recovery. One is "A Survey of Secondary Recovery and Pressure Maintenance Operations in Texas in 1958" prepared by the engineering department of the Railroad Commission of Texas. This is the fourth such survey and covers 258 injection projects begun since publication of the 1956 report. Copies are $2 each.

A subcommittee of the Interstate Compact Commission has prepared a report on the "Effect of the Curtailment of Production on Recovery from Water Floods and Other Secondary Recovery Projects" which is also available from the Compact Commission. The report was undertaken because of the rapidly expanding effect of unprorated secondary projects on the level of oil production. Conclusion of the committee is that final recoveries are not greatly affected by rate of flooding but that profitability is affected.

New "King-Size" Barge

A unique "long-tank" barge designed to cut transportation costs of liquefied bases, such as propane, and anhydrous ammonia, has been developed by Bethlehem Steel Co's Beaumont, Texas, shipyard. The Bethlehem yard has delivered three of the "long-tank" barges since July, 1960.

The latest "long-tank" barge delivery, the ALAMO 1300, went into service in mid-September 1960. Owned by the Alamo Chemical Transportation Co., Houston, Texas, she loaded 1018.15 short tons of propane on her maiden voyage which began at La Porte, Texas.

Designed for inland waterways service, the ALAMO 1300 is an open type, or uncovered, barge. She has a length of 195 ft, breadth of 50 ft and depth of 12 ft. She has three long tanks, each with hemispherical heads and working pressure of 250 psi. Each tank is 14 ft I.D. by 162 ft 9 in I.L., and has a water capacity of 182,000 gallons. Total capacity is 546,000 water gallons, or 1,020 short tons of propane.

Argentine Petrochemical Project

A $70 million petrochemical complex to supply Argentina's major needs for synthetic rubber, benzene and chemical intermediates, will be built at San Lorenzo, a Parana River port about 250 miles northwest of Buenos Aires. It will be financed and constructed by Petroquimica Argentina S.A. (PASA), an Argentine company, owned by five major U. S. industrial corporations. They are: Cities Service Co., Continental Oil Co., United States Rubber Co., Witco Chemical Co. and Fish International Corp.

The petrochemical complex will consist of nine inter-related plants and will include two synthetic rubber plants; catalytic reformer and alkylation units for producing motor fuel and aviation alkylate for the Argentine Government and benzene for chemical manufacturing; and three chemical facilities to make chemical intermediates, butadiene and styrene. These three products are used primarily in synthetic rubber manufacturing.

At full capacity, the complex will produce annually some 32,000 tons of butadiene and 14,000 tons of styrene for use in making synthetic rubber and plastics; 45,000 tons annually of synthetic rubber; 850 b/d of benzene for chemical manufacturing; 8,800 b/d of high quality motor fuel; 1,300 b/d of alkylate for use primarily as aviation fuel and 11,500 tons of chemical intermediates.

Raw materials including distillate, propane, butane and carbon black feedstock will be obtained by pipeline from Yacimientos Petroliferos Fiscales (YPF) oil and gas fields and plants in the Campo Duran area in northern Argentina near Bolivia and from YPF's refinery at San Lorenzo.

PASA will also operate its modern catalytic reformer at San Lorenzo for YPF on a negotiated basis and annually will furnish YPF with 2,900,000 barrels of high quality motor fuel, 425,000 barrels of aviation gasoline and 175,000 barrels of propane.

Export Sales Managers Named

G. H. Campbell has been made district sales manager in South America with San Paulo offices by the chemical division of Goodyear International Corp. C. S. Pyne was named to head sales in northern Europe and F. W. Milward in southern Europe. Mr. Pyne's offices will be in Brussels and those of Mr. Milward in Paris.

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Halliburton-Welex Merger

Halliburton Co., Duncan, Okla., has merged Welex, Inc., of Fort Worth and Houston into the Halliburton Co. The Welex organization thus acquires full status as an operating division of Halliburton and will now become known as Welex, a division of Halliburton Co. Turner Armstrong is general manager of the new division. Welex, Inc. was originally acquired by Halliburton in 1957 and has operated as a wholly owned but independently managed subsidiary corporation. Welex manufactures electronic logging, perforating, and well surveying equipment and provides these services to the oil industry throughout the Free World.

C-B Moves to Houston

C-B/Southern, a division of The Cooper-Bessemer Corp. has transferred manufacturing operations of a short stroke compressor line to Houston. Central parts warehousing will be located in Houston for Cooper-Bessemer's world-wide service organization.

Backflow—not Outflow

National Foreign Trade Council says that twice as many dollars have been returning to the USA in recent years from previous private investments abroad than have been sent abroad for such investments. In 1959, receipts from USA private investments in foreign plants and equipment amounted to some $2.2 billion in dividends, interest, and royalty payments. That topped the $1.3 billion net outflow of new capital for direct investments abroad. "Foreign direct investment does not represent in any sense a flight from the dollar, but is rather a reflection of the inherent confidence which the business community has in the sustained growth potential of the nation's economy," says the council.

Crose-Perrault Export Sale

Socoman, a French company, has purchased double jointing equipment for pipe from Crose-Perrault Equipment Co., for use on a large pipeline project in Algeria.

The Tulsa manufacturer's double jointing unit will be used in the construction of 150 miles of 30-inch line as part of a pipeline to extend from Edjeleh to Hassi Messaoud, for which the target completion date is June 1961.

Socoman has participated in large Algerian pipeline construction projects during the past three years. Its current project is the laying of 90 miles of an 8-inch line as part of a pipeline running from Hassi R'Mel to Hassi Messaoud.

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The Sonic Log

(Continued from page 47)

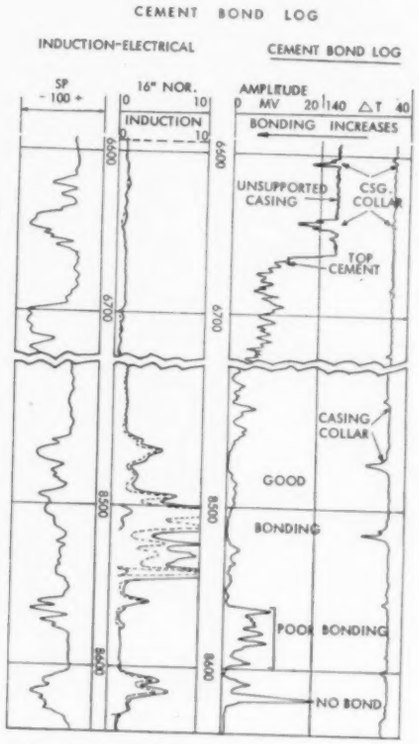

Fig. 10—Example of Cement Bond Log, showing various degrees of bonding of cement to casing.

lems such as: cement setting time; quantity of cement and rate of injection; influence of hole caving on cementation; influence of scratchers' water and mud contaminations; effectiveness of squeeze cementation. They may likewise provide valuable guides in planning water-shut-off repairs.

Conclusions

Sonic Logging is a relatively new method, yet its introduction can be considered as one of the most significant progresses in logging technique. Engineering studies are continuing, in order to improve the accuracy of sonic measurements and investigate new fields of application.

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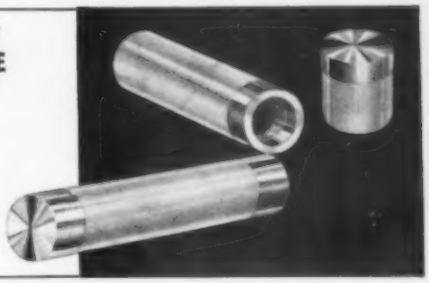

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